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PATENTS FOR INVENTIONS.

ABRIDGMENTS
OF
Specifications
RELATING TO
ICE-MAKING MACHINES, ICE SAFES, AND ICE HOUSES.
(INCLUDING THE USE OF FREEZING AGENTS FOR PRESERVING ALIMENTARY SUBSTANCES).

A.D. 1819–1866.

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PREFACE.

THE Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering therefore the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume have been overlooked. In the progress of the whole work such omissions will from time to time become apparent, and be supplied in future editions.

This volume contains Abridgments of Specifications to the end of the year 1866. It is intended to continue them to the end of the year 1876 as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the inventor can continue his examination of the Specifications relating to the subject cf his search by the aid of the Subject-matter Index for each year.

This series includes, in addition to the manufacture of ordinary ice, the making of confectionery ices, and the use of ice and freezing mixtures in pickling and curing meat and in freezing, cooling, and preserving alimentary substances. Freezing mixtures; ice breakers or choppers; and non-conducting materials for ice safes, ice houses, &c., are admitted; also refrigerators of the nature of ice safes and wine coolers; but refrigerators used by brewers, distillers, and wine makers will be found in the series, now in course of preparation, entitled "Brewing, Wine-making, and Distilling Alcoholic "Liquids."

H. READER LACK.

February, 1877.

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ICE-MAKING MACHINES, ICE SAFES, AND ICE HOUSES.

ICE-MAKING MACHINES, ICE SAFES, AND ICE HOUSES.

(INCLUDING THE USE OF FREEZING AGENTS FOR PRESERVING ALIMENTARY SUBSTANCES).

A.D. 1819, January 15.—No. 4331.

SALMON, Robert, and WARRELL, William.—" Improve-" ments and sundry apparatus for cooling, condensing, and " ventilating worts, liquors, and all other fluids or solid " matters." The patentees produce cold and condensation or congelation "by causing a blast of air to act on the surface " of water so as to force the water into vapour if required, " then again to re-collect the same and again decompose or " evaporate it," and "deposit the colder parts for use and " leave the caloric to escape." They state that the shape and size as well the method of applying their apparatus are various, and that they do not confine themselves "to the " introduction of the whole of the described parts together."

The parts are (1) a fan or fans or any of the condensing engines already in use; (2) "breakers" or pieces of iron or wood "placed in the cooler promiscuously at pleasure" but standing on feet "totally detached" from the cooler; their upper edge is "divided like saw teeth" and stand somewhat above the surface of the liquid; (3) "descenders" or "loose " pieces of board or metal with proper loaded feet placed in " the cooler;" they "force the passing liquor to go to the " bottom" of the cooler; (4) "revolving discharges" for cooling liquid of considerable depth; they are somewhat like paddle wheels; the blast moves them round "plunging the " boards into the hot liquor and exposing them to the blast " alternately;" (5) "confiners" or pieces of board or metal placed over the revolving discharges, resting on the sides of the cooler, and removable; (6) "conductors" or "conducting " doors" at one or both ends of the cooler (as one or more fans or condensing engines are used); these when open "leave the blast at liberty to escape," and when closed "prevent the discharge of the blast, which is then reconducted by "slight trunks under, over, or by the side of the cooler, to "resupply the fan;" (7) "a division board" placed in the cooler "to occasion a revolving" of the liquid.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 36 (*second series*), p. 193; Rolls Chapel Reports, 8th Report, p. 133.]

A.D. 1824, January 1.—No. 4884.

VALLANCE, John.—"An improved method or methods of "freezing water." The apparatus used by the patentee is of the following description:—A flat-bottomed cylinder (of cast iron and "of about four feet diameter by about the same "depth" and flanged at the top) is provided with a cover which is secured to the flange by bolts and is therefore removable when required. From one side of the cylinder extends a pipe forming a communication between the cylinder and two air-pumps which are fixed in a reservoir and "covered with "water." In any convenient part of the cylinder "is a hole "to which a cock and pipe are attached leading from a reser-"voir of water." In the cover are three holes (stopped air-"tight with plate glass) and a stuffing box for the passage of a hollow piston rod. The disc at the lower end of the rod *is* "most slightly conical and nearly as much in diameter as "the cylinder;" in it are holes stopped with glass and "corresponding to the sight holes in the cover." The top of the piston is connected by an air-tight joint to a tube, the upper end of which passes through a stuffing box into a cylinder "about twice as deep" as the one before mentioned. Fixed in the top of the cover of the upper cylinder is a pipe provided with a stop-cock and connected at its other end to a vessel "of stout sheet lead." This vessel (for its shape see the sheet of drawings) is "close at top and open at bottom;" it is filled with "lead balls similar to musket balls but too large to "fall through the hole in the bottom." The balls are kept constantly wet with sulphuric acid from a lead pipe leading from a lead vessel and connecting the two vessels. As air passes upwards through the vessel with the open bottom, "it goes through the interstices between the lead balls;" contact with the acid "absorbs the aqueous vapour the air was charged with," and the air passes into the upper cylinder dry and "becomes "rarefied."

The method of using the apparatus is described at length in the Specification. The quantity of water congealed at each time is as much as will cover the bottom of the lower cylinder, "about a quarter of an inch deep." After the first congelation a like quantity of unfrozen water is let in upon that which is frozen; the operation is repeated until the cylinder is full; and the ice may be taken out "in any "convenient manner." Hydrogen gas may be used instead of air, and "any other convenient substance for depriving air "of aqueous vapour."

[Printed, 6*d*. Drawing. *See* London Journal (*Newton's*), vol. 8, p. 251.]

A.D. 1824, August 28.—No. 5001.

VALLANCE, JOHN.—"An improved method of abstracting "or carrying off the caloric or fluidity from and congealing "water (or it may be other liquids); also an improved method "or methods of producing intense cold; also a method or "methods of applying this invention so as to make it available "to purposes with reference to which temperatures about or "below the freezing point may be rendered productive of "advantageous effects, whether medical, chemical, or me"chanical." These effects are produced by means of an apparatus, "which causes a current of air rarefied to a "degree that renders it less then one thirtieth of its usual "density, and which has been freed from moisture and made "quite dry, by contact with sulphuric acid, to sweep over the "surface of the water to be frozen." As fast as this air leaves the surface of the water, "it is brought into contact with "sulphuric acid in a way that deprives it of the vapour it car"ried from the water and renders it perfectly dry and capable "of performing the same office again;" after again sweeping the surface of the water, it passes to the acid, and is dried again, "and so on during pleasure."

The apparatus is composed of a vessel containing water, a cylinder provided with the working parts, and a vessel holding sulphuric acid and "spherical shaped bodies three or four "inches in diameter" and not corrodible by the acid.

The cylinder is connected to the water vessel by a pipe furnished with a stop-cock, and to the acid vessel by two pipes (of not less than six inches bore), the upper one to carry the air from the cylinder to the acid vessel, the lower one to conduct the air back again after it has been desiccated. The cylinder is about two feet in diameter and eight in depth. The bottom is a cylinder nearly three feet deep, moving easily up and down in the outer cylinder and having its bottom formed of a plate which is turned up at the edges so as to make a trough (three inches wide by four deep) round the lower end outside the outer cylinder. This trough is filled with quicksilver, and when the inner cylinder is drawn up into the outer one, "a joint completely air-tight is formed "directly." The plate is made with a stuffing box for the passage of a rod, which is moved up and down by means of a screw thread on its lower portion, a handle or cross, and a nut fixed in a piece of timber below. On the top of the rod is a disc or plate, "on which the water to be frozen is affused." In the sides of the outer cylinder are holes with glass cemented therein, serving as sight holes. The upper part of this cylinder "is rendered a pump" by means of a false bottom, a piston, two vertical pipes, and valves in the false bottom and the pipes opening upwards. Below this false bottom is fixed another false bottom, carrying a pipe about six inches in diameter and allowing a "passage from below to above it." This pipe carries at its lower end a slightly conical disc which overhangs the plate whereon the water is poured. The top of the cylinder is fixed on air tight; it is furnished with a stuffing box for the passage of the pump piston rod.

The acid vessel (lined with lead) is about "six feet in "diameter and eight feet high;" it is a cylinder having fixed to its lower part "a conical bottom which terminates in an "aperture about two inches wide." To the bottom around the aperture is attached a leaden pipe "about thirty feet "long," its lower end being turned up and hanging in a cistern lined with lead. At that part of the vessel where the conical bottom is fixed there is inside a perforated plate, and the plate and perforations are carefully protected with lead from the action of the acid. The before-mentioned spherical bodies occupy a space of about five feet above the plate. In the cover of the vessel is a stuffing box through which passes part of the pipe of a funnel. The lower portion of this pipe (inside the vessel) is bent; the under side of the bent part is perforated with holes as small as can be made, and the end is stopped up. The funnel (and therefore the pipe) is arranged to move round by wheel-work, so that the bodies are supplied with a constant spray.

The mode of working this apparatus, and the various modifications which may be made in it are detailed in the Specification.

[Printed, 1*s.* 2*d.* Drawing. *See* Repertory of Arts, vol. 1 (*third series*), p. 424; London Journal (*Newton's*), vol. 11, p. 298.]

A.D. 1834, August 9.—No. 6655.

WRIGHT, LEMUEL WELLMAN.—" Improvements in machinery " or apparatus for refrigerating fluids." The principal parts of this apparatus are (1) an accurately bored cylinder provided with a stuffing box at the bottom and at the top with a cover fitted with an air-tight joint; (2) a piston rod working up and down through the stuffing box, and carrying at its upper end a dish for receiving water and below the dish " a piston " formed by two discs pressed together by a nut and screw " with a leather cup between them;" (3) a screw thread cut on the lower portion of the rod and moved by bevel gearing and a winch; (4) a funnel, the tube of which (furnished with a stop-cock) is inserted into the cover of the cylinder; (5) " a lateral passage " formed by a tube, the ends of which are fixed in apertures in one side of the cylinder, so that, when the piston is in its lowest position, there is a communication between the portions of the cylinder above and below the piston; the passage is provided with a stop-cock, and the two cocks are opened and shut simultaneously (by hand) by means of a connecting rod; (6) a strainer attached to the under side of the cover " in order to distribute the water let out from " the funnel and cause it to descend through the cylinder in " the form of a shower;" (7) a jacket enclosing the cylinder and containing water or any other cooling material; (8) a conical air valve in the bottom of the cylinder. The lower disc is accurately fixed to the inside of the cylinder; the upper one " is made tight by the edges of the leather cup."

The patentee describes his method of making ice in the apparatus. Instead of water surrounding the cylinder, " a " blowing machine may be employed to drive a current of " air " between the jacket and the cylinder.

[Printed, 6*d.* Drawing. *See* London Journal (*Newton's*), vol. 6 (conjoined *series*), p. 219; Rolls Chapel Reports, 7th Report, p. 164.]

A.D. 1834, August 14.—No. 6662.

PERKINS, Jacob.—"Improvements in the apparatus and " means for producing ice, and in cooling fluids." The patentee is enabled by means of his apparatus "to use volatile " fluids for the purpose of producing the cooling or freezing " of fluids, and yet at the same time constantly condensing " such volatile fluids and bringing them again and again into " operation without waste."

The water or other fluid, from which "it is desired to re- " move the caloric and thus reduce its temperature and even " produce ice," is put into a cistern well-covered in and surrounded by a non-conducting material. Inside the cistern is secured a vessel which contains the volatile fluid to be evaporated, by preference ether. Connected with the cistern is an ordinary pump, called by the patentee "the vapour pump," intended to withdraw the vapour as it is generated in the vessel and to force it through refrigerating pipes in a condenser. A pipe, leading from the top of the vessel to the pump, is provided with a valve "to close the entrance into " the pump in order to prevent the vapour being forced back " into the vessel on the return stroke of the piston." Another pipe, having a valve opening outwards from the pump, connects the pump with the refrigerating pipes, and the vapour after being forced through them returns through a connecting pipe into the vessel. A valve moderately weighted, "say " about atmospheric pressure," and placed between the condenser and the vessel, prevents the return of the ether until " the same has become compressed and forced to give off its " caloric to the condensing water on the outside of the " condensing tubes."

The patentee prepares his apparatus "for commencing " work" by filling every part thereof "with the volatile " liquid to the utter exclusion of the atmospheric air, after " which a sufficient quantity of the liquid is drawn off by the " small pump attached to the [weighted] valve to make " sufficient space for the vapour, say at least one half."

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 7 (*new series*), p. 13; London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 196.]

A.D. 1842, January 27.—No. 9240.

BENJAMIN, Henry, and GRAFTON, Henry.—"Improve- " ments in preserving animal and vegetable matters." This invention is particularly applicable to preserving fish, and the freezing mixture is composed of about one part of salt and six parts of crushed ice.

The fish is put into a metallic vessel which is filled up with cold water. The vessel is placed in a wooden trough containing the freezing mixture, and the fish "thus prepared "may be kept in a pure state for a considerable length of "time."

To preserve fish for a short time, it is placed in baskets or on slabs in a close room which the heat of the sun cannot penetrate, and the air in the room is caused by means of revolving fans to circulate against the surfaces of metallic vessels containing freezing mixtures. The surfaces require to be frequently brushed over and kept clean to get rid of the frost which forms thereon.

Meat or vegetables are treated in the same manner.

The proportions of salt and ice may be varied, and other freezing mixtures may be used.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 18 (*new series*), 233; London Journal (*Newton's*), vol. 22 (*conjoined series*), p. 303.)

A.D. 1843, July 6.—No. 9825.

MASTERS, Thomas. — "An improved freezing, cooling, "churning, and ice-preserving apparatus, the parts of which "may be used separately or in combination." An oblong case mounted on four legs is divided into an upper and a lower compartment, and the upper one contains (generally) two circular pails "which are precisely alike in all respects." In each pail are two vessels; the inner vessel is "a conical-"shaped vessel of pewter for holding the water, cream, or "other matter desired to be frozen or churned." The outer one is of zinc or other suitable metal, and (generally) "of a "circular form for holding water or any other matter to "which a circular form in the frozen state is desired to be "given;" its top is covered in "with an overlapping lid." The space between the vessels holds the "frigorific mixtures." The inner vessel is arranged to revolve by reason of its bottom resting on a spindle which is rotated by bevel wheels, a fly wheel, and a handle. A "three-bladed spatula" is kept steady in the middle of the inner vessel by means of a rod, which passes through one of several holes in the handle of the spatula and through holes in the lugs of the pail. The spatulas, vessels, and pails are provided with suitable lids, and a rotatory motion is communicated to the working parts of the other pail by means of a strap "passed round two pulleys "affixed to their respective spindles." Between the pulleys there is fixed "a strap-tightening apparatus."

The case may be made to carry only one pail; in this arrangement the parts are "worked from the top." The shape of the outer vessels may be varied. The spatulas may have any required number of blades and may be supported in different manners. Suitably lined drawers may be inserted between the legs or may serve as a mounting for the apparatus thereby including in it "a wine cooler" and "an ice-preserv-"ing apparatus."

[Printed, 1*s*. 2*d*. Drawings. *See* Mechanics' Magazine, vol. 40, p. 81.]

A.D. 1845, July 21.—No. 10,781.

LINGS, John.—"Improvements in apparatus for the preser-"vation of provisions." The patentee constructs safes, closets, &c. in such manner that provisions may be preserved therein in either "a cold or hot state."

The safe, &c. is made with an outer and an inner casing, the latter by preference of zinc. The case between the casings is filled with some non-conductor of heat. The interior is divided into compartments, and the middle is occupied by an ice box and a drawer to receive the water which drips through the perforated bottom of the ice box. The box is supplied with ice by raising the top of the safe, and the water is removed by drawing out the drawer to the front. In the front of the safe are two doors (or a double door), and the inner one is made with a casing; the space between the casings is filled with non-conducting material. A siphon pipe may be substituted for the drawer.

The safe may be used "as a hot closet" by filling the box with steam or hot water instead of ice.

A wine cooler and a portable chest for carrying provisions, &c. may be constructed on a similar principle.

[Printed, 8*d*. Drawing. *See* London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 83.]

A.D. 1846, April 15.—No. 11,166.

HYDE, Simeon.—“ Improvements in refrigerators.”

[No Specification enrolled.]

A.D. 1846, September 17.—No. 11,372.

NEWTON, William Edward. — (*A communication.*)—“ Improvements in preserving fruit and vegetables.” By means of the apparatus described by the inventor fruit and vegetables are “kept at a temperature nearly approaching the “ freezing point of water without being actually allowed to “ freeze.”

The apparatus consists of two compartments, one of which constitutes an ice house; the other (or preserving compartment) “ may be constructed and used separately where there “ is already an ice house.” The apparatus stands in an excavation in the ground, and a space is left between them so as to prevent any transmission of heat. Each compartment “ is formed of a double box of plank”; the space between is filled with some non-conductor of heat, and the space between the compartments has a similar filling. The flooring of the compartments is supported above the bottom of the excavation, thereby allowing “ a free passage to the water” produced by the thawing of the ice. The apparatus is provided with a covering, and each compartment has its separate covering; all are “slightly pyramidal,” and each is made with a door or entrance. Ice is placed on the covering of the ice house, and the water therefrom will trickle down between the compartments, absorb any heat which may find its way through the non-conductor, “ flow under the preserving compartment “ and tend to keep it at the proper temperature.” The preserving compartment is surrounded on all sides with troughs or tubes which may be filled with water by means of vertical tubes; this, however, “ is only to be done when from excessive “ cold there may be danger that the contents” of the compartments may freeze. Planks on the outside of the troughs “ prevent the ice which may be interposed between the “ compartment and the excavation containing it from coming “ into direct contact with the inner planking.” The outer covering consists of “shallow boxes fitted closely together “ and containing charcoal or other bad conductor of heat.”

thus when the ice "requires to be renewed," either of the boxes may be removed without disturbing the others.

[Printed, 6*d*. Drawing. *See* London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 404; Patent Journal, vol. 2, p. 718.]

A.D. 1846, November 17.—No. 11,453.

MASTERS, THOMAS.—"Improvements in apparatus and " means for cooling liquids and filtering and preventing " liquids freezing." The patentee describes:—

1. An apparatus for cooling wine in bottles or decanters:—It is "very similar to what has before been used," but with two improvements. "On the exterior of the vessel called the " agitator" are fixed "vanes or projections," by means of which the freezing mixture will be "much more effectually " agitated than heretofore." The inner surface of the vessel next to the agitator is coated with enamel; and the two vessels are constructed so as to form "a water joint" at the upper part. A non-conductor of heat is applied to the outside of the apparatus.

2. Vessels "for cooling liquors or matters in bottles or " otherwise:"—These (either of glass or of enamelled iron and varied in shape according to their required use) are made " double"; the inner one holds the bottle, &c.; the freezing mixture is put in between the inner and the outer one and is kept in by closing "the opening or neck by any suitable " means." A funnel may be constructed on this principle, namely with an outer chamber to hold a freezing mixture. The apparatus may be made " in such a form as to fit a bottle " externally," the inner vessel being composed of a "water- " proof flexible material."

3. Decanters, jugs, and other vessels, either "with internal " arrangements to receive separate apparatus containing " freezing or cooling mixtures" or "with an internal air- " tight chamber to contain freezing mixtures:"—In the former case, the mixture is contained in a vessel carried by a stand, and the decanter, &c. is made with a hollow in the bottom to fit on to the vessel. In the latter case, the decanter, &c. has "the cooling vessel or chamber formed or affixed in " the interior," the entrance thereof being closed by a screw, cap, or other contrivance.

4. An apparatus for "making and cooling aerated liquids:" —The liquid is aerated in the lower portion of the apparatus; it is forced up into the upper portion where it surrounds a vessel containing a freezing or cooling mixture.

5. "Bag-filters:"—These are made with a "cooling apparatus" inside.

6. "An evaporating cooler:"—A double case, "so as to receive non-conducting materials between," is furnished with perforated shelves of enamelled iron or glazed earthenware, with a cooling apparatus, with an instrument for withdrawing the air, and with a cover opening on hinges and closed by a screw fastening.

7. Apparatus for applying cold to the human body:—Flexible waterproof caps or bags are filled with cooling mixtures, and are covered with felt or other suitable fabric.

[Printed, 3*s*. Drawings. *See* Patent Journal, vol. 3, p. 3.]

A.D. 1850, July 3.—No. 13,167.

KINGSFORD, JAMES.—(*A communication.*)—"Improvements in refrigerating and freezing." In the "combination and process" first described the inventor uses a pump, an "exhaust vessel," and a "reception vessel." Valves are so placed that exhaustion will take place on one side of the piston pump and condensation on the other. An induction pipe communicates with the exhaust vessel, and an eduction pipe with a coil of pipe, which after traversing the reception vessel enters the exhaust vessel, and "after coiling up and down or around several times for the purpose of exposure to the current passing out" into the induction pipe, "lies along the vessel in one of its upper angles." This horizontal portion of the coiled pipe has "perforations and perforated branches opening into the exhaust vessel." Water constantly flows through the reception vessel. The exhaust vessel is divided into compartments; each is intended to receive a water vessel "reaching the bottom and touching the side which the partitions do not touch, but not touching the side opposite nor the partitions." By this arrangement "the way through the vessel from end to end is indirect," and if air (or by preference ether) enters at a pipe at the farther end of the exhaust vessel, it will when drawn by the pump strike against each partition and water vessel before it reaches the induction pipe. "Branching tubes project "from the horizontal portion of the coiled pipe; they are made "with minute orifices to produce jets on each exposed "surface" of the water vessels. Sometimes a "second or "smaller pump" is used; it is not "ordinarily essential," but it will in some cases "be an important auxiliary"; it is worked simultaneously with the larger one, and the inventor describes its "objects and operation."

In the second, water "percolates through minute orifices in "the top" of the exhaust cistern, so that the water vessels "receive the small jets or drops equally over their lower "surface." The cistern "is kept in a state of exhaustion" through a tube at one end thereof, "while watery vapour can "pass" through a tube at the opposite end into a receptacle, within which a hollow cylinder revolves round a hollow axle. This axle is connected at one end "to the exhaust of the large "pump" of the first combination; it is perforated throughout its length "and opens into the cavity of the cylinder." The small pump exhausts the cylinder of the large pump, and the other end of the axle opens into the coiled pipe (called by the inventor the restorer) before-mentioned. The effects of this arrangement are described in the specification. "This "mode of operation admits numerous modifications, and the "parts numerous equivalents."

In the third, a volume of air or any gas, "with slight "renewals for waste," may be alternately expanded and contracted "and a cold liquid be passed out and conducted either "to the cistern to cool the water chambers and freeze water "in the contained vessels," or to a trough wherein the water vessels are placed side by side. Or the liquid may be "in-"jected into the exhausted chamber before-described and "arrest the watery vapour emanating from the water per-"colated into the same." The piston of a cylinder contains in its body "two sets of parallel tubes, an upper and a lower," and the tubes of each set "are connected as one space" by a cross tube. This cross tube is united by flexible coiled hose to pumps above it, so that liquid can be "forced by either "pump into that set of tubes" with which its hose unites it. These tubes "lead out by long, narrow, and parallel slits" through the piston and terminate at the lower surface thereof in a diaphragm pierced with small holes to allow the liquid to be forced out in a shower into the cylinder beneath the piston. The bottom of the cylinder contains two sets of tubes in like manner as the piston, "except that the narrow slits lead up "into the cylinder and spread when near and at their "extremity;" each set are connected "by entering at their "extremities into a cross tube." As it is essential "that the "shower in one part of the operation should enter the upper "set of bottom tubes or chambers," and in another the lower, a "frame valve with triangular bars" is provided; it is "worked backward and forward by the stem which passes "through the side." The valves in the induction pipes of the pumps "do not close completely but allow a partial "regurgitation," and below each pump-piston "there is air "or an air vessel" above the liquid. The forcing action is regulated or checked by other valves or equivalents. "The "action in full" and a modification of some parts of the combination are described in the specification.

[Printed, 10*d.* Drawings. *See* Repertory of Arts, vol. 17 (*enlarged series*)' p. 77; Mechanics' Magazine, vol. 54, p. 36; Patent Journal, vol. 10, p. 210.]

A.D. 1850, August 22.—No. 13,234.

NEWTON, William Edward.—(*A communication.*)—"Im-"provements in machinery or apparatus for producing ice "and for general refrigeratory purposes." This apparatus "consists essentially" of (1) an engine by means of which "air is compressed or condensed;" (2) receivers or reservoirs into which "the compressed air is forced;" (3) an engine in which "the compressed air from the reservoir expands and "exerts its force to aid in working the condensing engine;" (4) pumps which "inject jets of water into the condensing "engine to absorb the heat disengaged by the air as it is "compressed;" (5) similar pumps "to inject the uncongeal-"able liquid into the expanding engine in order that its heat "may be absorbed by the expanding air;" (6) a refrigerating chamber wherein "the articles to be cooled are placed, and "which also forms a reservoir for the uncongealable liquid, "the latter being drawn from it to be forced into the expand-"ing engine, whence it is returned to the room after it has "given out its heat to the expanding air."

Each part of the apparatus is fully described, but the inventor does not confine himself to the details as "many

" variations" can be made in both " the form and arrange-" ments of the parts." He claims,—

1. "The means for effecting the absorption of heat dis-" engaged from air during its compression in the condensing " engine," namely, diffusing jets " in a shower of fine spray" throughout the interior of the condensing cylinder.

2. The use of an engine so arranged as "to render the " expansion of the compressed air gradual," and at the same time to " render available the force which the air in expanding " exerts to aid in working the condensing engine."

3. The use of " intermediate receivers," into which the compressed air and water are conducted " in order that " they may separate before the air passes into the main " reservoir."

4. The construction and use of the refrigerating chamber :— It is " a close chamber " placed at a convenient distance from the expanding engine. Its interior is divided into a large chamber and several smaller ones. One of the partitions is " solid from top to bottom;" the others are perforated " to " allow the uncongealable liquid to circulate round the larger " chamber." The pipes, through which the uncongealable liquid and expanded air are conducted from the expanding engine, "terminate in a single forked pipe which introduces " the air and liquid at one end of the series of small chambers." The last chamber in the series " is connected with the valve " chests" of the condensing engine by a pipe, through which the expanded air after passing through the series of chambers " is conducted to the condensing engine to be recompressed " into the air reservoir." This last chamber of the series is also connected by a suction pipe with the pump " which " supplies the uncongealable liquid to the expanding engine." Each chamber is fitted with a suitable removable cover, and the walls and bottom of the refrigerating chamber " are made " double in order that a stratum of some bad conductor of " heat (charcoal dust for example) may be inserted in the " hollow space."

5. The means whereby the expanded air is utilised and subjected to recondensation.

[Printed, 1*s*. 8*d*. Drawings. *See* London Journal (*Newton's*), vol. 39 (*conjoined series*), p. 137; Mechanics' Magazine, vol. 54, p. 178; Engineers' and Architects' Journal, vol. 14, p. 209; Patent Journal, vol. 10, p. 261.]

A.D. 1852, September 23.—No. 14,300.

MATHIEU, FRANÇOIS.—(*Partly a communication.*)—" Improve- " ments in apparatus for containing, aerating, refrigerating, " filtering, and drawing off liquids, and in ornamenting " such apparatus." The first part of this invention relates " to the refrigerating of beverages of all kinds," and the improvement consists in encasing the vase or other vessel which holds the beverage " in a double case or jacket " of metal or other suitable material. The space between the sides of the case is filled with ice or any refrigerating mixture. The refrigerating case "is never brought into contact with the " sides " of the enclosed vessel; it is fitted with a lid and may be made "into any ornamental design."

[Printed, 1*s*. 8*d*. Drawings. *See* Mechanics' Magazine, vol. 38, p. 297; Practical Mechanics' Journal, vol. 6, p. 69; Artizan, vol. 10, p. 254.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 6.—No. 270.

GRIMES, JOHN.—(*Provisional protection only.*)—" An atmo- " spheric freezing machine." A metal receiver, having a screw stop-cock at the top, is exhausted by means of an air pump. A cylinder of zinc or other suitable metal and intended to hold the water, mixture, &c. to be frozen, is supported inside the receiver on a metal stand. A copper ball " of sufficient strength " to resist a forcible bursting pressure " communicates with the receiver by means of a pipe and double stop-cock. The ball can be charged by unscrewing the pipe in the space between the cocks.

The water, &c. having been placed in the cylinder, the receiver is exhausted; a portion of the highly condensed air in the ball (cooled to the temperature of the atmosphere or artificially below that temperature) is let into the receiver; and any excess thereof is allowed to escape through the stop-cock at the top.

[Printed, 4*d*. Woodcut.]

A.D. 1852, December 24.—No. 1166.

NESMOND, Pierre Charles.—" Improvements in machinery " applicable to the manufacture of ice and to refrigerative " purposes generally." Two casings and an air pump are mounted on a foundation plate, which " must be mounted on " small rollers." The casings are made of non-conducting substances which are kept together by an outer cover of iron or wood.

One casing contains a condenser and " a cooling reservoir " placed above the condenser" and "containing water for " absorbing the caloric disengaged from the air by condensation." The water "is retained by a sheet iron or galvanized " partition." A wooden lid lined with sheet iron covers the " cooler when the condensation of the air has taken place," and when the water has run out through a tap in the side.

The other casing (or refrigerator) is divided by an iron plate into an upper and a lower compartment, communicating by a tube.

The lower compartment (called by the patentee the dilatator must have a capacity equal to that of the condenser ; the upper one, which must be " three times larger," contains two vessels " of different forms " (for the shapes see the annexed sheet of drawings) " which in certain cases are to serve as congelators." Each congelator consists of an external and an internal vessel, a valve of a substance which no liquid can affect, and a tube " serving to conduct the dilated air from the apparatus " and provided at its upper part with a tap. The lid of the refrigerator is closed by means of screwed bolts. The two cases are connected by a tube between the condenser and the lower compartment, and the tube is furnished with two taps which are so united by levers that they are "prevented from remaining " simultaneously open."

The patentee does not describe his method of operating but he states at length the " numerous purposes " to which his apparatus may be applied.

[Printed, 8*d*. Drawing.]

1853.

A.D. 1853, January 15.—No. 106.

VION, Hippolyte Charles. — "Improvements in apparatus "for refrigerating." This invention relates to the production of cold "by the evaporation of liquids and more particularly "of liquefied gas." The apparatus is constructed in such a manner that "the latent heat absorbed by the vaporized gas "may be only taken from the liquids or substances," the temperature of which it is desired to lower, "and not from the "surrounding heat, or at least in trifling quantities," so that this method "allows the vaporized gas to be continually "collected and to be employed for producing the same "effects."

The patentee describes two arrangements of apparatus, the principal difference being that the first consists of more parts than the second; the latter appears to belong more especially to the present series, as it serves "to separate from the water "the bodies which are soluble, or which are congealed "at about the point of congelation of the water;" it also "permits the latent heat of the ice to be economized and of "only having to absorb the specific heat of the substances." The principal parts are (1) precipitating vats filled with liquid to be operated upon; (2) gas recipients with iron lids; (3) a condenser enclosed in a bath; (4) pumps; (5) "suction cocks "by which the pumps draw in the recipients;" (6) feeding cocks whereby "the condenser sends to the gas recipients, "when empty, the liquefied gas;" (7) floats "indicating the "working of the liquids;" (8) manometers "indicating the "pressure which the liquid bears," others "the tension of the "liquid gas;" (9) thermometers; (10) a manhole in the lid of each recipient; (11) gearing for raising and lowering the vats. When the vats are raised up to the recipients, a "caoutchouc "washer" serves to make a joint between the top of each recipient and the vat below it.

The working of each arrangement is described. The "various "applications" of the invention are stated, and among them is mentioned "for the preservation of food by the surrounding "of it with ice."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1853, January 20.—No. 147.

WILLIAMS, William. — "Improvements in refrigerating "apparatus." The improvements consist in (1) the employment of "cylinders fitted with plungers" for the compression of air; (2) the construction and arrangement of "a separate "condensing or absorbing chamber," wherein the compressed air has its heat absorbed "by being caused intimately to mingle "with water or other fluid of a temperature below that of the "air forced therein;" (3) the placing the cylinders and the condensing chamber in a tank which is constantly supplied with fresh cold water; (4) the arranging and combining valves in connexion with the refrigerating apparatus "whereby air "compressed and cooled may be caused to expand in imme-"mediate contact with the water or other matters to be "cooled."

Three cylinders, each provided with a stuffing box and a plunger, are bolted to a "valve chamber," the whole being secured to the bottom of a water tank. The valve chamber is divided into two chambers; the one receives a constant supply of air (from above through pipes) which enters the cylinders on the ascent of the plungers and is forced into the other by the descent of the same. This air passes through siphon pipes into a condensing or absorbing chamber, cylindrical and secured to the tank and with one end passing through a side of the tank for the adjustment of a stuffing box. A shaft carrying vanes (by preference perforated with holes) passes through this chamber, and the chamber is supplied with water from the tank by a "double action" force pump, which both forces water into the chamber and withdraws the water from it.

The air thus compressed and cooled passes through a pipe (furnished with stop-cocks) into an "expanding apparatus." In this is "a shallow tank," to the bottom plate of which cylindrical vessels are riveted. In the bottom of each vessel is placed an "expansion" valve connected to the pipe by a branch pipe, and in each vessel is a conical vessel attached to the top plate of the tank by a flange joint. In each conical vessel is placed an expansion valve communicating with the pipe by a flexible tube. The water, &c. to be frozen is put into the conical vessels, and the spaces between the outer and inner vessels are filled with "liquid congealable only at a much

" lower temperature" than water. The expansion valves consist of " self-acting ball or other suitable valves enclosed in small " chambers," and the top plates of the chambers are perforated with small holes.

The patentee describes the action of each part of his apparatus; he does not however confine himself to the precise description given of either part, " so long as the peculiar " character of any part thereof be retained."

[Printed, 1*s*. Drawings.]

A.D. 1853, April 7.—No. 843.

FULLER, William.—(*Provisional protection only.*)—" Improve-" ments in ice pails or apparatus for refrigerating." The vessel containing the cream or water turns on a pivot at the bottom and is supported on a step placed at the lower part of the pail. A spindle rising from the bottom of the vessel passes through a cross piece which is hinged to one side of the pail. A winch handle is fitted to the upper end of the spindle. The operator turns the spindle and vessel with one hand, whilst with the other he stirs or mixes the substances which are being operated upon.

[Printed, 4*d*. No Drawings.]

A.D. 1853, May 4.—No. 1089.

MASTERS, Thomas. — " Improvements in apparatus for " freezing, cooling, and churning." This invention consists in so constructing the vessel which holds the substances to be frozen, &c. as " to expose a large amount of surface to the " freezing mixture or to the liquid employed to facilitate the " churning."

Inside a pail or other non-conducting vessel is placed " a " second and hollow vessel for containing water or other liquid " to be cooled or frozen " and provided with a tap, which passing through the pail allows the cooled liquid to be drawn off. This second vessel holds the rough ice or freezing mixture and a vessel " provided with an inner conical tube." The cream or other substance is put into the inmost vessel, and the freezing mixture is brought into contact " not only with the " sides but also with the centre or conical tube, whereby a " large amount of surface is exposed thereto." A spindle passing through the vessels carries at its lower end an agitator for stirring the freezing mixture, on the part inside the inmost vessel a forked spatula, and at the upper end (after passing through the cover of the pail) a crank or other handle. The pail after the removal of the inmost vessel "forms a wine "cooler."

Modifications:—(1) The hollow vessel may be omitted. (2) The inmost vessel may be shaped so as "to form a mould." (3) The handle may be attached to one side of a cover applied to the inmost vessel, and the spatula may retain stationary. (4) Several sets of the apparatus may be united by the use of agitators formed with teeth on their edges and geared together. (5) The apparatus may be "combined with a wine cooler;" in this case the conical tube is "only carried partially up in the "interior" of the inmost vessel.

[Printed, 10*d*. Drawings.]

A.D. 1853, October 31.—No. 2517.

ASSANTI, DAMIANO.—"A new or improved cooling and freezing mixture." The cooling mixture consists of "crystallized "chloride of lime" (by preference reduced to powder) and water or other suitable liquid. The cooling and freezing mixture is composed of "crystallized chloride of calcium" and water. The proportions used by the patentee are two parts of chloride to one part of water. The ingredients are put into a vessel, so as to surround the vessel containing the matters to be cooled or frozen, and are therein stirred by means of a spatula or by the revolution of the vessel.

[Printed, 4*d*. No Drawings.]

1854.

A.D. 1854, February 23.—No. 437.

PRUDAY, THOMAS DANSON.—"Improved apparatus for cooling "liquids and edible substances." The patentee describes (1) a wine cooler for a single bottle:—It consists of an outer and an inner case; the space between is charged with pieces of ice, and there are secured to the bottom of the space vertical pegs whereon the pieces may rest, leaving the lower portion free to receive the draining of the melted ice. The space is covered up air-tight by a lid. The inner case is of metal and made to fit the shape of the bottle, so that it may rest upon and be supported by the shoulder of the bottle. The outer case is of any suitable material; if it is of metal, "a ledge with a sunk groove" is formed round it to receive any condensation which may result from the humidity of the atmosphere. The cooler is lifted off the bottle by means of a handle on the top, and if desired, the bottle may be held in the cooler by "a supporting plate secured by a bayonet "joint beneath."

(2) A cooler for soda water, lemonade, &c.:—It is constructed on the same principle. There are inner cases or sockets for holding the bottles; an outer case; a perforated plate for allowing the water to drain into the space below; and an air-tight lid. The cooler may be constructed so that the bottles may be placed therein with their necks downwards. Again, the inner case may be shaped to hold a beer or water jug.

For the convenience of travelling there may be added to the coolers "shaped wells for receiving raised pies and other kinds "of viands." Sometimes "the air-tight case or jacket" is constructed to apply "to the cooling of viands only."

[Printed, 8*d*. Drawing.]

1855.

A.D. 1855, May 16.—No. 1105.

SIEMENS, Charles William.—" Improvements in cooling "and in freezing water and other bodies." In the apparatus required for these purposes a cistern "rests upon a second "cistern." The upper one (of wood or other material) is lined with metal in such manner that a non-conducting substance may be inserted into the spaces "which are left at certain "parts between the sides of the cistern and the lining, "and between its floor and the lining." A plate, "extending "along two sides of the cistern," divides off a chamber (called the salt chamber); and another plate on the opposite sides divides off a smaller chamber (called the water chamber), which communicates with a central chamber by a pipe on the under side of both. The central chamber contains "a series " of guides or tubes arranged alternately close on to and " a little above " the bottom lining so as to cause " an " upward and downward current of the cooling solution." An "insulating partition on all the four sides" (composed of plates with charcoal powder between them) divides off a chamber "from the space or chamber immediately around " the central chamber," and this space is occupied by the vessels which contain the water, &c. to be frozen.

The lower cistern contains a coil of pipes, and the overflow from the upper cistern is conducted by an outlet pipe into the lower one and surrounds the coil. A pump raises the solution, as may be required, from the lower cistern to a third cistern, which is mounted over a boiler and communicates with it by a pipe carrying a ball tap. A pipe passing from the boiler is extended into a worm inside the third cistern; it then descends and unites with one end of the coil in the lower cistern; the other end of the coil "extends upwards " and bends over and into" the water chamber. There is a discharge tap from the boiler, and under the tap is "a " crystallizing vat."

The central chamber is filled with crystallized chloride of calcium. The vessels are filled with the substance to be frozen and are closed with insulating covers. The water chamber is filled with water, which passes into the central chamber and penetrates " a considerable mass " of the crystals " in passing upwards and downwards between the tubes or " guides into the space or chamber around." The solution fills this space " up to the level of the overflows of the insulating " partition," and passing between the vessels "descends into " the narrow surrounding chamber;" when this is filled, the surplus is discharged by the outlet pipe into the lower cistern. Here the solution absorbs a further portion of heat from the coil "containing condensed water from the boiler." The pump raises the solution into the third cistern; the solution descends and having "reached its proper level in the boiler" is made to boil. The steam passing through the pipe and worm is condensed by contact with the solution in the third cistern; it then descends into the coil in the lower cistern, "is considerably cooled by contact with the solution" in this cistern, and rises thence into the water chamber "to be there "almost reduced to the freezing point previous to its again "entering" the central chamber. "The concentrated solution "is drawn from the boiler from time to time," is received into the crystallizing vat, and is there crystallized in from 12 to 24 hours. The crystals thus obtained are put into the salt chamber "to be cooled down to nearly 32° Fahrenheit "and to be again dissolved" in the central chamber. To produce "intense degrees of cold in the apparatus," a small quantity of ice or snow is put into the central chamber.

[Printed, 10*d*. Drawing.]

A.D. 1855, November 14.—No. 2559.

TOLHAUSEN, Alexandre. — (*A communication from Louis Joseph Frédéric Margueritte.*)—(*Provisional protection only.*)— "Improvements in producing ice." The water required for the quantity of ice to be produced is put into an ice cellar. A rapid and powerful current of air, introduced "at the "moment when the temperature gets down to the freezing "point," is caused to pass over the surface of the water.

A ventilator in the upper part of the ice cellar "produces "a draught of air, which it withdraws and expels from "the cellar," and pipes or other openings let in the air from without.

Or moveable pipes are used to let in cold air, and openings in the upper part of the cellar cause the air to be constantly renewed.

Or the current of air is accelerated "by lighting at the "foot of a draught chimney a fire near the upper part of the "ice cellar."

[Printed, 4*d*. No Drawings.]

1856.

A.D. 1856, January 11.—No. 85.

NEWTON, Alfred Vincent.—(*A communication.*)—"A new "and improved method of curing meats, preserving provisions, "and ventilating and cooling buildings, cars, and vessels." The structure in which the curing and preserving are effected is called by the inventor a "pork or fruit house;" it contains a curing room with an ice room by its side, two rooms or floors above the curing room, and a ventilating flue which communicates by means of valves with the curing room and those above. The ice room and the curing room are connected by openings provided with sliding doors, and the ice is always kept above the openings. The air which enters the curing room is admitted into the ice room through an opening in the top; it passes down through the interstices of the ice and is cooled before it enters the curing room; after passing through it ascends either through the flue or into the rooms above, according as the valves are shut or opened. There are steps for passing from the curing room to those above and doorways at the top of each flight "made to fit tight." There are also "hatchways through the floors" of the upper rooms for the purpose of raising or lowering provisions or fruits.

The curing room may be "enveloped in an ice house" with openings to admit cold air from the surface of the ice, and fans may be employed to drive the air over and around the ice.

In applying the invention to refrigerators or ventilators, "the arrangement for traversing the air over or among cooling "surfaces is substantially the same."

[Printed, 6*d*. Drawing.]

A.D. 1856, March 28.—No. 747.

HARRISON, JAMES.—"Producing cold by the evaporation "of volatile liquids in vacuo, the condensation of their "vapours by pressure, and the continued re-evaporation and "re-condensation of the same materials." The patentee uses for the purposes of his invention an apparatus composed mainly of (1) "a conical evaporating vessel of tinned copper," having inside "a spiral shelf" fastened round it but "only "partially in contact with the side," so that the liquid will flow round the spiral and trickle downward; the liquid which reaches the bottom falls over "frets or barriers" which are so placed "as to keep the greater portion of the bottom covered "with the surplus fluid;" (2) a cistern containing the cone and the water to be cooled or frozen; (3) "a spherical copper "condensing vessel" enclosed in a cistern which is kept replenished with water; (4) a double-action pump mounted between the cisterns; (5) a small single-action pump (situated below the other pump) "for obtaining the vacuum required "at starting and for restoring and maintaining a vacuum" if required; a condensing worm is attached to the egress pipe for the purpose of "saving whatever portion of ether should "be expelled during its action;" (6) a copper vessel "for "receiving the condensed liquid;" it stands near the first-mentioned cistern and is fitted with a funnel, a float valve, and a screw for raising the float valve "to open the com-"munication between the two parts of the machine, as in "creating the primary vacuum;" (7) the requisite connecting pipes, stop-cocks, and pressure gauges.

The apparatus is set in action "by working the pumps so "as to produce a vacuum throughout the series of vessels." The action is described in the Specification:—Ether is poured in through the funnel; after being forced into the cone, the vapour is continually pumped out into the condenser; it is there "liquefied by the pressure," and passes thence into the vessel situated near the cistern; thence it is forced into the cone "to be again withdrawn, compressed, and liquefied, so "long as the apparatus shall be kept at work sound and "uninjured."

The patentee does not confine himself "to the arrangement "of apparatus described;" he prefers (for the manufacture of ice) vessels shaped differently from the cone; two shapes are shown in the annexed sheet of drawings.

[Printed, *6d.* Drawing.]

A.D. 1856, April 15.—No. 902.

FULLER, William.—"Improvements in ice pails," namely in that description of pail in which ice creams or water ices are made. The vessel containing the liquid to be frozen is made in the shape of "a bowl with a curved bottom," so that, when the bowl is rotated, the liquor will be thrown round the bottom and sides "in a thin film." The bowl is provided with a central spindle and is rotated by means of a handle on the upper part of the spindle; it is maintained in a vertical position by a cross bar secured to the sides of the pail.

One of the chief objects of this invention consists in arrangements for facilitating the removal of the cover from the bowl, and the patentee describes three :—

1. The cover is made in two parts and provided with flanges which fit one on the other.

2. The cover is slotted so as to allow it to pass the spindle, and the slot is then covered over either with a piece hinged on to the cover or with a removable piece.

3. The cross piece is made in two parts, which fit round the spindle and are secured by a temporary fastening, such as a ring or pin.

Ordinarily the handle is made to fit on the square end of the spindle, but in ice pails of large size the spindle is rotated by means of bevel gearing and a winch handle.

[Printed, 10*d*. Drawing.]

A.D. 1856, June 28.—No. 1522.

SLOPER, Bevan George.—" Improvements in freezing, refrigerating, and cooling, and in the machinery employed " therein." This invention relates to freezing, &c. " by " intense cold produced by the expansion of air."

In a cistern filled with water is placed an exhausting cylinder having an air-tight metallic piston. The piston rod (by preference) is connected directly with the piston rod of a steam cylinder. Each end of the exhausting cylinder is provided with two valves, one an exit valve opening outwards under a pressure equal to that of the atmosphere, the other a " slide entry " valve " worked in closed valve chests by a rod " working through stuffing boxes." The valve chests communicate by a pipe which communicates with a reservoir termed by the patentee the cold reservoir. Over the exhausting cylinder are two vessels having at each of their ends a slide valve (forming entry valves) and an exit valve; a pipe from the exit valves communicates with the cold reservoir. This reservoir consists of " a series of layers of pipes placed one " above the other at intervals of about one inch or more," and the whole series " has only two points of communication," namely one with each of the communicating pipes. The series is placed in a closed chest which has at one end an opening " through which air is forced with considerable velocity by " a fan," and at the other an opening through which the air passes into another chest termed by the patentee the freezing chest and containing vessels with water, &c. to be cooled or frozen or pipes to contain air or liquids for refrigerating purposes. "At the opposite end" of the freezing chest is an opening "which communicates by pipes to the entry of the "fan, which is otherwise made air tight;" thus a current of the same air is made to circulate by the fan between the pipes of the cold reservoir, through the freezing chamber, and back to the fan, and so on.

At each stroke of the piston the air in the cold reservoir is partially drawn out; "the limited qnantity of air contained "in one of the air chambers rushes into the cold reservoir" and by its expansion "produces intense cold." This cold is communicated "to the interior surface of the pipes of the "cold reservoir." At the same time the air driven by the fan between the pipes "gives up its heat to them and becomes "intensely cold;" it then passes into the freezing chest and circulates between the vessels or pipes, and thence back into the fan, "thus circulating continuously."

Liquid, "capable of resisting congelation under great cold," may be substituted for air and a fan.

[Printed, 10*d*. Drawing.]

A.D. 1856, August 25.—No. 1976.

MENNONS, Marc Antoine François.—(*A communication.*)—"A new composition applicable to the coating or covering of "metallic and non-metallic surfaces." This "non-conducting "and inoxidable" composition is applicable to the coating of "ice repositories," as it "effectually prevents the penetration of heat."

The ingredients of the composition and the proportions (which may be varied) are prepared clays "of different kinds "and containing a certain proportion of alumina" 100 parts; oily substances or residues 6 parts; oil sediment 5 parts; fat 2 parts; animal charcoal 2 parts; vegetable charcoal 2 parts; mucilaginous substances 1 part; sawdust or ground wood "already employed in the purification of oils or in dyeing "processes" 10 parts; waste hair well beaten 4 parts; a decoction of logwood treated with nitrate of iron together with a small proportion of soot.

The clays are kneaded with water to a consistent mass; the other ingredients are added in succession; the whole is then thoroughly mixed and brought to the consistence required.

In the construction of outer or inner walls or partitions a continuous framework is formed of thin planks; coatings of the composition are applied thereto; the last coating is smoothed and polished, and when dry is coated with unboiled linseed or other oil.

[Printed, *4d.* No Drawings.]

A.D. 1856, October 13.—No. 2397.

PIATTI, Giovanni Battista. — "Improvements in the pro-" duction of ice." In carrying out this invention the patentee uses an apparatus, of which the chief parts are "a large pipe" termed "the cooling well" and a chamber termed "the " freezing chamber," each surrounded with a jacket of charcoal or other non-conductor of heat.

The well is provided at the bottom with suitable valves. Below the well is a chamber which communicates by means of a pipe with an air pump. The pump has connected to it a reservoir in which the air is previously compressed, so that " a continuous and uniform current" passes into the chamber and thence into the well.

The water in the well, when it is sufficiently cold, passes into the freezing chamber through a pipe which is provided with a stop-cock "and runs right through the middle of the " chamber." Boxes are set on the freezing chamber on each side of the pipe and communicate with it by means of orifices therein, and when they have received the necessary quantity of water, the stop-cock is closed, and any water that may remain in the pipe is discharged through a tap near the outer end of the pipe. In the freezing chamber is an under chamber, which allows compressed air to act between and around the boxes. For this purpose the under chamber "is hermetically " closed but is capable of communicating with the exterior" by means of two pipes which are provided with stop-cocks and are attached to an exhaust air pump. Currents of compressed air are from time to time forced in through one pipe, and the air having expanded in the under chamber is drawn out through the other. In order that the compressed air may be equally distributed throughout the freezing chamber, a pipe having several perforated branch pipes " is made to run " along its bed," and the air fed in through the induction pipe passes through this pipe and out through the perforations.

Instead of compressed air "a current of vaporized ether, " or by preference, carbonic acid gas, might be employed;" in this case the gas drawn out is again injected into the chamber. The boxes have covers, and over the covers "must " be laid straw, bags of sawdust, or other suitable material."

The patentee describes two arrangements of valves, either of which may be used " for closing the bottom of the well."

[Printed, 8*d*. Drawing.]

1857.

A.D. 1857, May 6.—No. 1278.

ROPES, Henry Tibbets.—(*A communication.*)—(*Provisional protection only.*)—" Improvements in refrigerators or portable " ice houses " for the cooling and preservation of provisions, fruit, wine, &c. and for obtaining a supply of iced water.

A horizontal grating whereon the ice is laid is fixed within a suitable chamber near the top, and a close water tank is placed below the grating and at the bottom of the chamber. In the top or upper portion of the sides of the chamber there is an opening (one or more) for the admission of atmospheric air above the ice. The air, cooled by contact with the ice, descends to the bottom of the chamber and passes thence through one or more openings into a preserving chamber which is furnished with gratings or shelves. At or near the top of the preserving chamber provision is made for the escape of the moist heated air generated therein.

The ice chamber may be either " immediately above or at " the side " of the preserving chamber; in the former case " the bottom of the ice chamber or shelf upon which it is " laid will require to be water-tight, and the cooled air " carried through a passage or passages therefrom, so as to " enter at or near the bottom of the preserving chamber."

Attached to the ice chamber is a mallet for the purpose of breaking the ice; it has "an egg-shaped head and the blade " of a sprig-bit inserted in one end."

[Printed, 4*d*. No Drawings.]

A.D. 1857, May 27.—No. 1484.

CLARK, William Steitinius.—(*A communication from George W. Robinson and Charles W. Lord.*)—(*Provisional protection only.*)—" Improvements in machines for producing artificial " ices from cream and other liquids." The machine consists of (1) an outer and an inner cylinder, both closed at the lower ends; (2) four " circular concentric rising and falling planes "; (3) two vertical rods attached to the planes and united at the top by a cross piece.

The inner cylinder is filled with ice and salt; the outer cylinder is surrounded with ice; the cream is poured into the space between the cylinders; the planes are inserted into the same space; a cover is put on to the outer cylinder, and the operator moves the planes " rapidly up "; this movement " cuts or planes the ice from the cylinders as fast as it " accumulates," and the ice falls down into the space between the cylinders.

[Printed, 4*d*. No Drawings.]

A.D. 1857, July 29.—No. 2064.

SIEMENS, Charles William.—(*Provisional protection only.*) —" Improvements in refrigerating and producing ice, and in " apparatus or machinery for that purpose." This invention relates " to freezing and refrigerating by the expansion of air " or elastic fluids." The air is compressed by means of a pump; it is cooled in the compressed state, and is then allowed to expand in a cylinder. The air thus cooled is brought into contact with the substance or article to be cooled or frozen, and is then conducted through " an interchanger " (consisting of a series of tubes enclosed in a case), " by which " it is made to cool the compressed air which enters the " interchanger in the opposite direction."

The cylinder is immersed " in brine or a solution of chloride " of calcium or other suitable fluid which will not congeal " at the temperature which it is required to produce." The expanded air passes into a series of tubes immersed in the brine and perforated on their under sides, so that it passes through the brine "in a multitude of streams or bubbles"; or "it may be admitted into a casing surrounding the brine "vessel and allowed to pass through perforations in the "sides." The brine vessel is covered, and "cold air is con- "veyed from it through the interchanger." The substance, &c. to be cooled or frozen is immersed in the brine; if a liquid, it may be "conducted through tubes in the interchanger or "exposed to the contact of the cold air, so as to cool it down "before it enters the vessels in which it is to be frozen."

The construction of the interchanger may be varied.

[Printed, 4*d*. No Drawings.]

A.D. 1857, September 10.—No. 2362.

HARRISON, James.—"Improvements in apparatus for pro- "ducing cold by the evaporation of volatile liquids in vacuo." The ice-making apparatus described requires "a motive power "of ten horses" and contains one hundred ice moulds.

The refrigerator is either a vessel "similar to a tubular "boiler but having the tubes placed more closely together," or a series of sheets of copper, "each pair of sheets being "separated by half-round gnurled wires at short intervals, "fixed in sloping positions," and "communicating with a "common receptacle for the vapour."

The condenser either "consists of spiral tubes" or is tubular "similar to the boiler but placed perpendicularly"; the tubes communicate with a central vessel in such manner that "should there be a leakage of air into the apparatus," such air will collect into the central vessel and be withdrawn by a small pump and forced into a separate vessel connected with another condenser.

The refrigerator is enclosed in a cistern; ether or other volatile liquid "occupies the interior spaces between the "lower tubes," and the upper tubes are surrounded by the vapour thereof. A liquid, either an alkaline or saline solution or an alcoholic or other mixture not congealable at the degree of cold required to be produced, passes through the tubes, thence into a trough where it passes over the surface of the ice moulds, and then is "pumped up to the level whence it

" primarily flowed." A pump withdraws the vapour of ether from the refrigerator and forces it into the condenser; here " by means of the pressure aided by a stream of cool water," the vapour is reduced to the liquid state and is returned through a vessel into the refrigerator, "where it again under-" goes evaporation."

The Specification contains a very full description of the connecting parts of the apparatus, of the method of working, of modifications of certain parts, and of certain calculations made by the patentee.

In small machines intended for domestic use, some of the parts required for the above-described are omitted, and the refrigerator is surrounded with chambers which serve as provision safes, cellarets, &c.

[Printed, 1*s.* 2*d.* Drawings.]

1858.

A.D. 1858, May 6.—No. 1011.

BRIDGMAN, John. — (*Provisional protection only.*) — " Im-" provements in cooling fluids and in the application of " cold." The inventor applies his invention to "salting or " curing meat in hot weather" as well as to brewing and other purposes for which a low temperature is required.

He uses a cold liquid resulting from a mixture of ice with common or other salts, or with an acid or acids, or with salts and acids. He cools brine, wort, or other liquids, by passing the cold liquid through tubes or passages immersed in or in contact with the liquid to be cooled, and sometimes he causes the two liquids "to flow in opposite directions."

He preserves provisions, &c. by putting them into chambers which are supplied with air "cooled by causing it to pass " through a bubble up through the freezing mixture." The vessel containing the mixture either may be open at the top and placed in the chamber or be closed and provided with a pipe leading from the top to the chamber; air is blown into the vessel through tubes or perforations by means of a fan, pump, or blowing machine.

"The ice may be economized" by blowing air through cold water, then through a vessel containing a freezing mixture which is nearly exhausted, and then through a vessel containing a fresh freezing mixture.

[Printed, 4*d*. No Drawings.]

A.D. 1858, May 12.—No. 1071.

KNIGHT, Richard.—" Improvements in apparatus for re-" frigerating, also for bottling aerated liquids, and in the " preparation or storing salts for the production of artificial " mineral waters." The shape of the refrigerating apparatus may be varied according to the article to be enclosed therein. The apparatus is composed of an outer vessel, an inner vessel, sometimes a stand, and between the vessels a " cover or " vessel" made by preference of perforated zinc. The outer vessel is of zinc or other suitable material, and usually cylindrical. The inner vessel is " closed in at top," and the article to be cooled is placed in it. The " cover or vessel" stands in the space between the two vessels; it is covered on both sides with felt or other woollen fabric and is provided at its upper part with a lid which is covered with felt. Ice is put into the space between the inner vessel and the cover or vessel, and the lid is then put on. Sometimes a bag is used for the covering vessel.

If a stand is required, " to enlarge and heighten the capa-" city" of the inner vessel, the bottom and sides are made double and lined with felt or other non-conductor of heat; a groove of felt is formed around its top; and the edges of the outer and inner vessels are made thin and " of a wedge-like " form " so as to enter the groove.

[Printed, 8*d*. Drawing.]

A.D. 1858, July 19.—No. 1621.

BRAY, Charles.—(*Provisional protection only.*)—" Improve-" ments in ice safes." An outer case of wood, lined with felt and closed by a lid, contains an inner case of wood, lined with metal and closed by a lid. In the upper part of the inner case is a metal box for receiving ice; the box is perforated at the bottom and provided with a close-fitting cover, so that the safe may be opened without exposing the ice. Underneath the box are several metal cylinders or compartments for bottles or other articles and so arranged that the water which drains from the ice trickles over the bottles, &c. "The ends "of the cylinders pass through to the outer case;" each is closed by a separate cover, and the series is closed in by a hinged flap on the outer case.

The articles to be cooled are placed in the compartments, and anyone can be taken out therefrom "without opening and "exposing the other compartments."

Against one side of the ice box is fixed a cistern for holding water; on the other side are shelves for the reception of any articles which it is desired to cool; at the bottom of the case is a trough for receiving the water which drains from the ice, and a pipe for conducting the water away.

[Printed, 4*d*. No Drawings.]

A.D. 1858, September 13.—No. 2074.

SIEMENS, Charles William.—"Improvements in refrigera"tors, and in the treatment of the freezing or cooling ma"terial or materials used therewith." The freezing or cooling is produced by dissolving chloride of calcium or other chemical salts or compounds. The refrigerator is composed of a series of vessels or chambers one within another, of an annular shape, and so arranged that the solution shall be gradually produced by means of a current of water "passing "upwards through a tube and distributed from the top of "such tube so as to spread itself amongst and afterwards "descend through the body of the salt," and then gradually pass out from the apparatus. The solution in its circulation comes into contact with (1) removable vessels containing the liquid or material to be frozen; (2) a compartment or compartments through which water may pass or circulate for the purpose of being cooled; (3) removable articles, such as bottles, jars, &c. for the purpose of cooling them also.

The vessels or chambers of the refrigerator are (1) an outer can consisting of two casings which have the space between them filled with a non-conductor of heat; (2) a casing or partition "situate at a short distance within and around the lower "portions of the sides" of the outer can, and "above the "bottom thereof," thereby forming an "annular space or "passage;" (3) an inner can "having no bottom but holding "its contents" in the space between the two casings of which it is composed; (4) a "central chamber" consisting of the space included within the inner casing of the inner can; (5) an "annular chamber" formed by the space between the outer casing of the central chamber and the inner casing of the outer can.

The top of the refrigerator is covered with two lids, one over the central chamber, the other over the annular chamber and "made in several parts;" each consists of two casings, and the space between is filled with non-conducting material. Two pipes or tubes communicate with the annular space or passage; the one is a feeder or inlet from the outside of the refrigerator; the other is a discharge or outlet into the central chamber and is surrounded with "a conical casing," the space between being filled with non-conducting material; a gauze wire cylinder for holding the chloride to be dissolved fits on to the cone. Two pipes or tubes "pass through cased channels "in the lid" of the annular chamber, one being a feeder from the outside of the refrigerator, the other a discharge therefrom. A discharge pipe from the annular chamber passes through the outer can. A cylindrical frame holds the removable vessels in position; it has "vertical slits or openings "immediately opposite to each of the said vessels." For the complete performance of the freezing process these vessels are made "of a long and narrow taper form, circular or otherwise "in section, covered at the upper end and closed at the "bottom with a moveable cork or elastic plug to prevent "bursting when solidification ensues."

The mode in which the refrigerator acts is described in the Specification. The water, "to be much reduced in temperature but not frozen," enters by the feeder in the lid, circulates through the refrigerator, and passes out through the discharge pipe in the opposite side of the lid. The removable articles are put into the annular chamber. The water to dissolve the chloride enters through the inlet which communicates with the annular space or passage and dissolves a portion of the chloride; the solution acts upon the exterior of the vessels and then upon the exterior and interior of the casings which hold the water; finally, it passes through the chamber containing the articles and out by the discharge pipe.

The "spent solution" is put into evaporating pans "for the "purpose of recrystallization or reproduction of the salt or "compound which has been dissolved." The pans are arranged over a furnace or the flues thereof so as "to afford the means "of drawing off the contents of one or more pans into one or "more other pans;" the first-mentioned pans are situate over the less heated portions of the furnace and are provided with "a scoop or bucket wheel" or a pump for lifting the solution "and allowing it to drop and so become exposed to a current "of air."

[Printed, 10*d.* Drawing.]

1859.

A.D. 1859, July 30.—No. 1766.

HAECK, François.—"Improvements in refrigerating appa-"ratus, especially adapted to pumps or other apparatus for "the supply of beer and other liquids." A pump is fixed in a trough containing cold or iced water. The body of the pump consists of two concentric cylinders, between which is a narrow space or channel. The liquid to be acted upon is raised through a pipe in the bottom of the outer cylinder into the channel, whence it passes through another pipe into the refrigerating part of the apparatus.

This part is composed of four concentric cylinders, of which the two in the middle form the channel for the reception of the liquid. Cold or iced water or other refrigerating means fills the space between the outer cylinder and the one next to it. There are suitable inlets and outlets for the iced water and the liquid.

When the quantity of liquid to be acted upon is small, the refrigerating means in the trough and between the cylinders may be stationary; otherwise it must be renewed from time to time. When the liquid is in a vessel "placed at a sufficient "height," the pump may be dispensed with.

The Specification contains a description of "a double

" cylindrical" apparatus on the same principle and the modified arrangement of pipes, &c. required.

[Printed, 8*d*. Drawing.]

1860.

A.D. 1860, July 4.—No. 1614.

HARRIS, George Stephens.—(*Provisional protection only.*)— " Improvements in apparatus for rapidly cooling or refrige- " rating water, wine, beer, or other liquids." A refrigerator " of any known and approved construction" may be used. Coolers of any suitable shape and material are fixed inside the refrigerator and are wholly or partially surrounded with ice therein; they are made with openings in their tops opposite to corresponding openings in the cover of the refrigerator, and the liquid to be cooled is poured into them by means of funnels. The openings are closed by means of sliding lids which may be made self-closing. At the bottom of the coolers are pipes which pass through the sides or bottom of the refrigerator and are provided with taps for drawing off the cooled liquid.

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 25.—No. 1804.

ASH, Henry Clarke.—" Improvements in apparatus em- " ployed in cooling and freezing liquids." The vessel containing the apparatus is (by preference) of earthenware, double at the sides and bottom, and having the space between filled with some non-conductor of heat; this is put in through holes in the bottom which are afterwards closed with cement. Inside the vessel is a loosely fitting piston having holes in it for the passage of the ice vessels and smaller holes to allow the freezing mixture to pass more freely from side to side. The vessel is fitted with a metal cover, which is pierced with openings for the passage of the ice vessels and the piston rod. The ice vessels are of metal, by preference cylindrical at the upper ends, fluted and somewhat tapering below; they are made at bottom with lugs which enter undercut notches in rings formed at the bottom of the outer vessel. In order to keep the substance in the ice vessels properly stirred, each is provided with a stirrer, the rod of which passes up through the cover of its vessel; the rods are connected by a cross bar which passes through them and the piston rod. The covers of the ice vessels are double and "of sufficient length to fill " the whole of the upper or cylindrical part," so that when the stirrers (on being raised) come against the bottom of the covers, "the semifrozen mass which will cling to the stirrer " may be forced constantly from one side of it to the other."

In making "dessert ices," either a pattern of the required mould is put into the vessel (after the ice is formed) and " forced down through the ice," or the pattern is mounted on a centre at the bottom of the vessel and "caused to revolve " thereon during the freezing operation."

To freeze water in this apparatus, an outer and an inner cylinder are used; the outer one fits into one of the holes in the piston; the inner one is closed at top and bottom and filled with a non-conductor of heat; the water is put into the space between the cylinders, and a cover is applied to the outer one.

[Printed, 10*d*. Drawing.]

A.D. 1860, October 15.—No. 2503.

DAVIES, GEORGE.—(*A communication from Ferdinand Philippe Edouard Carré.*)—"An improved method of and apparatus for refrigerating and freezing." This invention "is " based upon the absorption in closed vessels of liquefied " gases or condensed vapors by any absorbent body for the " production of cold, the separation and dissolution by heat, " accompanied by liquefaction in another vessel communicating with the former under the influence of tension combined " with a lower temperature, followed by the re-absorption by " the desaturated or impoverished liquid or body when it is " submitted to the action of cold." The agent used is "a " concentrated solution of ammoniacal gas," being the most readily obtainable if not the most suitable.

Two arrangements of apparatus are described; in the first the operation is "continuous," in the second "intermittent."

1. In a boiler (heated by fire or steam pipe) is enclosed "a " concentrated aqueous solution of ammonia," and the volatilized gas traverses a coiled pipe "placed above the boiler, and in which the steam brought over is condensed." A tube conveys the gas into a tubular condenser, where it becomes liquefied and passes out through a tube at the bottom, through a vessel " at a regulated speed," and thence through a pipe to a refrigerator. A pipe leads from the upper part of the refrigerator to an absorption vessel, in which water flows into a shallow perforated vessel, "whence it continually falls in " drops." The affinity of the ammonia and the water " creates " in this vessel a tension considerably less" than that maintained in the refrigerator; the water saturated with ammonia collects in the bottom of the absorption vessel; it is drawn thence by a pump, which forces it into a "closed receiver" surrounding the coiled pipe, " after it has previously traversed " a tubular apparatus where it is heated;" it flows from the receiver into the upper part of the boiler.

The ammoniacal solution in the lower part of the boiler " becomes impoverished, and at the bottom after a certain " time it is almost exhausted;" as it still contains ammonia " it becomes when suitably cooled subservient to the purposes " of absorption." It is therefore withdrawn through a pipe to the upper part of a regenerator, "in which the water " saturated in the absorption vessel circulates in the reverse " direction," and an "interchange of temperatures" here takes place. The cooling of the liquid which comes from the boiler is completed by its passage through a worm surrounded with water; from the worm it is conveyed through a pipe to the absorption vessel.

2. This is termed "an intermitted hydrostatic circulation " apparatus;" it is so arranged that "the gas purifies itself " before its liquefaction." On the top of a boiler is placed an upright tube " of about two-fifths the diameter of the former." A siphon rises inside the tube to nearly the top and descends again to a short distance below the bottom; it "forces the " gas disengaged in the boiler to bubble through the ammo- " niacal water before passing to the refrigerator." Another siphon " establishes a communication with the water space of " the boiler." The branches of each of these siphons are of " very unequal diameter" in order to prevent "their acting

"in a direction contrary to their original intention." On filling the boiler "by decanting from the refrigerator" or "on turning therein the liquid remaining in the latter after "one or several operations there always remains a small "quantity of liquid" in the first siphon, and the gas passing from the boiler "will bubble through this bath." The siphons "having always one of their extremities plunged into a liquid, "become mutually and alternately hydrostatically closed;" this forces the gas to pass through the first siphon and the purifying bath "during the disengagement" and through the other siphon "during the absorption." The gas is conducted through a pipe into "an annular receiver" in order to be liquefied by contact with cold water; the receiver is surrounded by a casing for the circulation of cold water. The other parts mentioned are a small vessel serving for the expulsion of the air, a tube plunged into the boiler for the reception of a thermometer, and a reservoir for cold water surrounding the upright tube.

The Specification contains a full description of the operation of each apparatus, of the applications of the invention, of the boilers, refrigerators, regenerators, and condensers, the form of which "may be indefinitely varied," of the cocks, &c. required in various parts, of sundry modifications, and of agents which may be used instead of ammoniacal gas.

[Printed, 1*s.* 8*d.* Drawings.]

1861.

A.D. 1861, July 3.—No. 1692.

JOLLEY, Richard. — (*Provisional protection only.*) — "An "improved apparatus for heating, cooling or drying, infusing, "extracting, or absorbing vapours and gases for manufac-"turing, medical, or domestic purposes, and for preserving "liquids and solids, alimentary or otherwise." The outer vessel may be of any shape or size and be constructed "upon any non-conducting principle." Inside this vessel are fitted vessels (one or more) of any suitable material and "of such a form as will cause the adhesion of vapours

" during the process of extraction." These vessels are provided with pipes, traps, and drains " for quickly carry" ing off what is extracted;" they may be used " with a " continuous flow or force of hot or cold water or air," or they may be charged " especially on the upper part" with any liquids or solids producing heat or cold according to the temperature required. Again, these vessels may be double, and the space between may be exhausted, or filled with any kind of liquid or solid, or warmed by gas or other means. Within the outer vessel is placed (in moveable cases or otherwise) any absorbing liquid or solid which has an affinity for the gas or vapour to be absorbed or extracted. To prevent " counter-attraction," all metals used in the construction are covered with some fibrous material. The outer vessel may be used by exhausting the air therefrom by heat, steam, or pumping.

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 4.—No. 1705.

MENNONS, Marc Antoine François.—(*A communication from Edouard Blée.*)—(*Provisional protection only.*)—" Improve" ments in the construction and arrangement of apparatus " for the manufacture of ice and for the refrigeration of solid " and fluid masses in general." In the covers of a double-action pneumatic pump are apertures giving ready access to valves. The suction valves communicate with an evaporating chamber by a conduit opening into a dome which serves as a casing to a series of corrugated vases. Volatile liquid is poured into the chamber through a tube in the dome, and the tube is closed by a conical valve. The base of the chamber is closed by a recipient into which the lower orifices of the vases open, and the whole is surrounded by a wooden reservoir charged with a saline acid or a suitable alcoholic or other solution.

On the opposite side of the pump is placed a condenser, the construction of which is somewhat similar to that of the evaporating chamber; it communicates with the compression valves, and its surrounding reservoir is charged with cold water.

On working the pump a vacuum is formed in the chamber, and the volatile liquid " instantaneously passes into a state of

" ebullition." The vapour is drawn up by the pump and thrown into the condenser; thence (being again converted into liquid) it falls into a reservoir and thence into a receiver. A tube, having its orifice provided with a float, connects the receiver with the recipient at the base of the evaporating chamber, and "the liquid is thrown into the latter by the " difference of pressure." The solution being reduced in temperature is drawn off by a stop-cock into a vessel containing the moulds, &c. wherein are the substances to be frozen; it is carried off by means of a small pump and forced into a vessel, whence, "after reducing the vapours which may have " remained in the upper section of the condenser," it flows back to the reservoir of the evaporating chamber.

By this arrangement there is kept up a "continuous circu-" lation of the refrigerating medium between the parts of the " apparatus in which its temperature is reduced and those in " which it absorbs the caloric of the substances under treat-" ment."

Atmospheric air may in certain cases be used instead of solution, and the required changes in the apparatus are described.

[Printed, *6d.* Drawing.]

A.D. 1861, July 31.—No. 1905.

WOOD, Alfred.—"Improvements in refrigerating store-" houses and in other structures in which a low temperature " is continually or periodically required." The arrangements of the buildings "may be variously modified;" the patentee claims the construction of storehouses, &c. in which there are chambers containing ice or other refrigerating materials and effectually protected from the warmth of the external air, whilst, "between one or more surfaces of the same which are " left exposed and the rooms or localities which it is desired " to refrigerate," there are formed spaces or reservoirs for cold air closed by means of trap-doors or sliding shutters, so that more or less of the cold air can be admitted from the reservoirs.

The walls of the buildings are hollow "having narrow air " spaces," and at a small distance above the ground a layer of asphalt "is laid in the wall all round the building." The roof is covered with boarding over which "is laid a thick

" thatch of straw." Inside the roof is the ice chamber; the sides consist of " a double thickness of close-jointed planking " lined with lead, zinc, or durable waterproof material, and surrounded with a thick layer of straw or other good non-conductor of heat. The chamber is carried by beams and joists which rest on cast-iron columns, and the latter serve as conduits to the water resulting from the melting of the ice. The water drains into boxes provided with gratings at the top and issues from the bottom of the columns through trapped pipes into a conduit.

The floor of the room to be cooled is separated from the ground by a layer of asphalt and wood-block paving. Between the room and the ice chamber is the reservoir of cold air; this communicates with the room by means of trap-doors consisting of a double thickness of wood and a lining of felt. Access to the room is obtained through double doors. The windows should be small, double, or even treble. The walls are lined with wood or felt. To fill or replenish the ice chamber an opening is formed " at one end in the gable wall;" this is " carefully bricked up again when the ice chamber is " full."

Several other arrangements on the same principle are described in the Specification and represented in the annexed sheets of drawings.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1861, November 28.—No. 3005.

DE LABAUME, Jules D'Adhémar.—(*A communication from Edouard Blée.*)—" Improvements in machinery for cooling and " freezing water and other fluids." This apparatus consists chiefly of a pump, an evaporator, a condenser, a vessel containing ether, and a covered chamber in which the ice is to be produced or the freezing carried on.

The pump is " of considerable internal capacity " as compared with that of the evaporator; its two inlet valves are connected by a pipe with the upper compartment of the evaporator, and its two outlet valves with the condenser. To prevent the escape of ether at the joints the cylinder is surrounded by a jacket full of water or other fluid. The inlet and outlet valves " are placed over passages formed in the end " covers of the cylinder;" they are adjustable by means of levers and weights, and above the upper and below the lower ones are covers with covered man-holes to facilitate the adjustment, &c. All the works of the pump "are covered with "water," and the piston rod is hollow "in order to conduct "lubricating fluid to the piston." In order that the piston may fit closely to the ends of the cylinder at the end of each stroke, the crosshead of the rod "has a longer stroke than "the length of stroke which can be given to the piston," and elastic pieces are introduced between the rod and head to prevent any of the parts from breaking.

The evaporator is constructed with an upper and a lower compartment; these are combined by upright tubes of small diameter, and a suitable fluid (by preference salt and water) flows freely between the tubes, the evaporator being placed in a cistern "so as to be immersed in such fluid." The compartments are connected by a tube (outside of the cistern), a part of which is of glass "to indicate the height" of the ether in the evaporator. The ether (when required) is drawn off into the ether vessel through a tap in the lower part of the evaporator; the tap is always covered with water. The fluid is drawn off from the lower part of the cistern into the ice-forming chamber through a pipe, and another pipe leads to another pump which forces the fluid from the chamber into the upper part of the cistern.

The condenser is similar in construction to the evaporator; it is placed horizontally in its cistern; it has "a much larger "area of surface" than the evaporator and contains twice as many tubes; from its outer compartment a branch pipe descends which is connected by a smaller pipe to the lower compartment of the evaporator.

One of the sheets of drawings shows two arrangements of the ice chamber, the one suitable for producing blocks of ice, the other for freezing or cooling liquids in bottles or other vessels. The mode of working the apparatus is also described in the Specification.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1861, December 7.—No. 3069.

JOLLEY, Richard.—"An improved apparatus for heating, "cooling, or drying, infusing, extracting, or absorbing "vapours or gases for manufacturing, medical, or domestic

" purposes, and for preserving liquids and solids alimentary " or otherwise." The patentee calls his apparatus a safe; it may be either fixed or moveable. It consists of two cases, one within the other, and the space between is filled with any non-conducting substance. The material used in the construction of the safe is "wood boarding double," and the joints of one layer of boarding are "covered by the other " boarding." Outside or between the layers is a coat of asphalt, felt, or any fibrous or pulpy substance. Sometimes the safe is made partly of boarding and partly of compressed fibrous pulp.

For the purpose of "cooling and extracting," vessels (one or more) are placed in the upper part of the safe; they are of such form "as will cause the adhesion of vapours" to them during "the process of extraction," and the vapours, &c. are conducted away "by pipes, drains, and traps." The vessels may be filled with water or frigorific mixtures, or they may contain tubes through which such mixtures or air flow; they may be made double, and the space between "may be ex-" hausted" or filled with any suitable liquid or solid; the tubes may be perforated. Again, the vessels may have perforations with or without descending tubes.

In any part of the inside of the safe may be placed "carbon, " charcoal, lime, salt, sulphuric acid," or any other suitable absorbent "for the purpose of stopping decomposition" in provisions and all perishable articles.

[Printed, 4*d*. No Drawings.]

1862.

A.D. 1862, March 18.—No. 746.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Joseph Weatherby Bartlett.*)—" Improved combination of cooling " and filtering apparatus, forming a safe for the preservation " of solid and liquid provisions." The patentee claims the combination of a cooling and filtering apparatus, " comprising " an ice case, reservoir, central chamber and base, with move" able table and shelves."

On a stand is mounted " a lower table or shelf turning over" on a pivot. The outer part of the apparatus is "a double " walled ice and water case," covered with a lid, and provided with "double walled door" and with handles for lifting it from the stand. In the upper portion of the case is a "box " for ice and water," and under the box is a filter connected with it in such a manner as "to be removed, cleaned, and " replaced at will." Under the filter is a chamber for provisions, &c. furnished with moveable shelves, and surrounding the chamber is a space for water or other liquid which is drawn off by a tap below. " In order to obtain a due equalization of air within the cooler and prevent condensation " in the inner chamber," a tube within the outer case descends from near the lid towards the base and through the space into the chamber. The ice box is supported by tubes perforated " so as to permit a free circulation of air from the outer case " through the chamber and the tube."

[Printed, 8*d*. Drawings.]

A.D. 1862, March 21.—No. 782.

SIEBE, Daniel Edwards.—" Improvements in machinery or " apparatus for refrigerating or producing cold, part of which " improvements are applicable also to other purposes." The Improvements relate to (1) the air pump; (2) the condenser; (3) the refrigerator; (4) the regulator by which the return of the ether from the condenser to the refrigerator is governed; (5) means of moving the moulds containing the liquid to be cooled or frozen " successively towards the refrigerating " power." The details of the improvements "may be variously modified."

1. The valves are actuated by cams, the position of which is "altered to suit the varying pressures." The valves open at the proper time "by means of a pressure or vacuum " gauge."

2. In the condenser the current of condensing water is caused to flow in a direction contrary to that of the vapour required to be condensed. The condenser is divided vertically into a larger and a smaller compartment. The larger compartment contains a series of pipes, and between each bend is placed a board "projecting from and attached to the " end" of the compartment. The smaller compartment holds an

air vessel to which are connected three pipes, two leading to the regulator, and the third to a pump which draws off "any "air that may collect in the vessel." The vapour enters through a pipe at the top of the larger compartment, descends through the series, and enters the air vessel near the bottom. The water enters at the upper part of the smaller compartment, surrounds the air vessel, then passes into the lower part of the larger compartment, and after traversing the length of the series leaves the compartment through an overflow pipe at its upper end.

3. The refrigerator is "multitubular," and the tubes are arranged vertically in the inner chamber. The tubes open into a cistern containing the liquid to be cooled; the liquid descends through the tubes and through perforations "in a "small chamber situated at the bottom" of the inner chamber, passes upwards and flows from the top of the outer chamber into the trough containing the moulds. The ether enters the inner chamber through a pipe and is drawn off by another pipe fitted with a vacuum gauge and communicating with the air pump.

4. The regulator is a metallic case inside of which is a float connected by a lever with a valve; on the rising of the ether to the level allowed a communication is opened with the refrigerator.

5. The moulds are arranged either singly or in sets of two or more; on one or a set being removed from the end nearest the refrigerating power, the others are moved towards it by a screw or other suitable means.

Each improvement is described at length in the Specification.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1862, April 15.—No. 1093.

RAINS, Rupert.—(*A communication from Georges Toselli.*)—(*Provisional protection only.*) — "Improvements in apparatus "for freezing, cooling, and churning." This apparatus is arranged "to be worked horizontally." A cylindrical vessel formed with a double case or jacket is pivoted to a framing; one end is closed, the other fitted with a cover. An inner cylindrical vessel is pivoted at one end to the outer vessel, "the other end being supported by a spindle to which a

" handle is affixed." The inner vessel consists of two parts screwed together.

To charge this apparatus, remove the cover, handle, and inner vessel; unscrew the inner vessel and fill it with the liquid to be frozen; screw the parts together; put the inner into the outer vessel, "turning same on end for that purpose;" fill the space between the vessels with freezing mixture; affix the lid and handle; turn the vessels into a horizontal position, and "by an opening in the outer case pour water into the " freezing mixture," and by another opening fill the jacket with cold water.

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 10.—No. 1411.

KOLBENHEYER, EMERICH.—(*Provisional protection only.*)— " An improved apparatus for making ices and cold bever- " ages." By means of "a winch handle with suitable " gearing and proper connecting and working parts" a rapid revolving motion is imparted to an inner vessel which turns on a pivot in an outer vessel or to a stirring apparatus in the inner vessel. The inner vessel contains the cream, &c., and the outer one the freezing mixture or ice.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 4.—No. 1686.

SANBORN, GEORGE HENRY.—(*A communication from Thomas Gates.*) — (*Provisional protection only.*) — " Improvements in " refrigerators." These articles are of any desired shape and size; usually they are cylindrical and made of galvanized iron or zinc. In the top is an ice chamber, and between the outer and inner cases is a space "designed for cold air and ice " water" and extending all round except at the part occupied by the door. The water is drawn from the space "in the " usual manner."

Shelves rest on supports fixed to the inner case, and on the bottom is a revolving table.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 17.—No. 1786.

CRESTADORO, ANDREA.—" Improvements in obtaining and " applying motive power from rarefied air and from aeriform

" fluids." The patentee effects his improvements by means of a furnace, in which a fire is kept up " in such a manner that " no air is admitted to feed the combustion except into and " through the ashpit through a pipe or pipes connected with " a rotary piston or pistons consisting of a paddle or fan " wheel." A portion of the pipe " expands into a compartment forming a hollow vessel or barrel," and this contains a fan wheel.

He proposes (*inter alia*) to utilise his furnace " as a refrigerat- " ing apparatus for producing cold and for making ice :"—The feed-pipe (at a suitable distance from the fire) is expanded " so " as to admit in its interior a vessel containing the liquid or " other substance" which is to be cooled or frozen. The vessel is so placed in the expanded portion " as to have no " other communication with the external air." A continuous current of air " rushing in through the pipe, as it passes " abstracts the caloric from the liquid or other substance " exposed to it in the interior of the pipe." The operation may be assisted " by a gentle stirring motion being commu- " nicated through any suitable moving apparatus to the " surface under refrigerating process."

[Printed, 6*d*. No Drawings.]

A.D. 1862, July 28.—No. 2139.

SELBY, FRASER.—" Improvements in surface condensers." These condensers consist of a series of chambers or cases (usually cylindrical), each containing a coil or coils arranged in such manner that steam may pass inside the coil or coils, and a separate stream of water or other fluid may enter each chamber and condense the steam. The coils may be made of either " parallel or taper tubing," and they may be arranged " either parallel or conical," or " placed round each other," or in any other convenient manner. " For small engines one " coil and chamber will be sufficient." If preferred, the water may pass inside and the steam outside the coil.

If only one chamber and one coil are used, " the exhaust " steam from the engine" enters " direct into the coil" and becomes condensed therein ; the resulting water is drawn out " from the bottom end of the coil." The cooling water enters the chamber through a pipe near the lower end and passes out through a pipe near the upper end, " or vice versâ." The ends of the chamber are united by a bolt or tube. If the chamber contains more than one coil, the steam passes through a pipe into a chest and thence into the coils.

When the condenser consists of a series of chambers, the steam enters the coils through a chest, and after condensation flows into another chest whence it issues through a pipe. The cooling water also enters the chambers through a chest, and the overflow passes out through a pipe attached to another chest.

[Printed, 10*d*. Drawing.]

A.D. 1862, August 4.—No. 2194.

DENNY, Abraham, and DENNY, Edward Maynard.—" Im- " provements in the manufacture of bacon." The pickling liquor is kept at an even temperature without emptying the vessel in which it is contained, thus avoiding the exposure of the meat to atmospheric influence.

The liquor, "adjusted to a suitable temperature as known " in the trade," is poured into a tank, and as soon as it " rises " above the proper degree of temperature," a portion is drawn off by a pump having a strainer at the lower end of its suction pipe. The portion drawn off passes into a vessel filled or partly filled with ice. The ice rests on a perforated tray, and the liquor percolates into a lower chamber, whence it is carried off through a pipe into a salt trough, and being thus " restored to its original condition in strength and tempera- " ture " re-enters the tank through a pipe.

The patentees do not confine themselves " precisely to the " kind of apparatus herein-before described."

[Printed, 8*d*. Drawing.]

A.D. 1862, October 15.—No. 2788.

BROOMAN, Richard Archibald.—(*A communication from David Joseph Kennelly.*)—" Improvements in refrigerating and " freezing and in apparatus employed therein." The heat is abstracted both by the evaporation of a volatile liquid and by condensation of the vapour arising from the substance which is being cooled or frozen.

An outer vessel contains an inner vessel ; the space between them is occupied by the volatile liquid ; and the inner vessel holds the liquid to be cooled or frozen, or a mould containing the liquid. The outer vessel is closed by an air-tight removable lid. A reservoir, "of a little larger capacity than" the inner vessel supplies it with the liquid to be cooled or frozen, and vapour when formed in the inner vessel passes up through a pipe into the upper part of the reservoir. A water tank has in its bottom a pipe, which descending is coiled round the outer vessel, and thence ascending to the top of the reservoir pours its contents through a rose-head over the surface of the reservoir; this water descends into "a saveall," and may return thence into the tank or may run to waste. Liquid is supplied to the reservoir through either a tap or an opening which must be hermetically closed when the apparatus is in work. A pump withdraws the volatile liquid from the space and sends it into a condenser, whence it returns into the space. Another pump exhausts the inner vessel, "carrying off some of the vapour arising from the water or substance therein." A moveable vessel fixed in a frame supplies the space with volatile liquid, and a gauge measures the quantity in the space.

"For the sake of economy the apparatus should be placed in a tube of wood or other non-conducting substance."

[Printed, 10*d*. Drawing.]

A.D. 1862, December 12.—No 3327.

WINIWARTER, GEORGE.—(*Provisional protection only.*)—"Improvements in the construction of portable houses, walls, or partitions of buildings, strong rooms, safes, refrigerators, reservoirs, piers, and other structures, also applicable to the construction of casks and similar articles, boats, and ships."

The walls or surfaces are constructed by placing metal tubes (sometimes "trough-shaped" lengths of metal) "bound round with straw or other similar material and steeped in clay, mortar, or cement," one on top or by the side of the other, between grooved posts, girders, or other supports. The ends of the tubes are confined in the grooves, and the whole forms "a strong air-tight surface which is a bad conductor of heat," and is much less bulky than ordinary walls.

Sometimes the tubes are placed on top or by the side of each other without such covering, and the interstices may be suitably packed; or the covering may be applied after the tubes are in place.

[Printed, 4*d*. No Drawings.]

1863.

A.D. 1863, March 5.—No. 631.

MORRIS, JOHN, and NEWTON, THOMAS.—" Improvements " in refrigerators and other like articles." The top of this refrigerator is divided into three compartments; the middle one is the ice well; the others contain the liquid to be cooled and are each supplied with a tap. The rim of the lid when closed falls into a small channel filled with water, thereby keeping the ice air-tight. The top, sides, and back, are packed with a mixture of " burnt cork, charcoal, dust, and " doe hair, or other like suitable material." A lower ice well extends over the bottom, and below this is a cistern provided with a tap. " Wide, flat, or other suitably shaped " channels formed in the back and sides" of the upper ice well convey the waste water to the cistern. By such arrangement " the usual central division is entirely dispensed " with, thereby obtaining increased space in the interior" and " effecting a saving of at least 100 per cent. in the consumption " of ice."

The refrigerator may be of any size or shape; it is made entirely of zinc, galvanized iron, or other suitable metal.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 25.—No. 1040.

LEGRAS, ALEXANDRE. — " Improvements in machinery or " apparatus for making ices," that is to say " confectioners, " ices." Each apparatus (there may be any convenient number actuated by driving bands or gearing from one driving shaft) consists of an outer fixed tub and an inner rotating vessel of tin or other metal. The lower end of a vertical spindle projects slightly beyond the bottom of the inner vessel, forming a pivot for the vessel to rotate on. The upper end of the spindle (above the edge of the inner vessel) is supported by a bracket piece which is provided with a collar for the passage of the spindle and fits into sockets situated in any convenient part of the tub. Round the edge of the inner vessel is a flanged collar for the reception of a driving band, and slots are cut through the tub for the passage of the band. Or a small pulley round which the band may pass may be fitted on to the upper part of the spindle. A lid closes the mouth of the tub but leaves the mouth of the inner vessel open.

The driving gear consists of one long driving shaft "common "to all the freezing pots" and the ordinary pulleys and bands, fly wheel, winch handle, bevel wheel, &c., and to each set of gearing is connected a sliding clutch, so that the workman is enabled "to stop any one or more of the pots" without interfering with the working of the others.

[Printed, 10*d*. Drawing.]

A.D. 1863, June 8.—No. 1423.

REYNELL, Henry.—"Improvements in the manufacture (by "the introduction of cocoa-nut husk or part thereof) of a "substitute for ordinary felt and kamptulicon, and in "utilizing said cocoa-nut husk or part thereof for packing "of wine coolers, refrigerators, and ice chests, and caulking "of ships and vessels." The fibrous substance is separated from the "powdery material resembling cork as regards the "lightness thereof," by cutting, stripping, tearing to pieces, or otherwise, and "by the same methods and means as those "practised by the manufacturers of cocoa-nut fibre."

The invention (as regards the present series) consists in using the powdery material (first rendered moist by water or other fluid) as a non-conducting packing for wine coolers, refrigerators, and ice chests.

[Printed, 4*d*. No Drawings.]

1864.

A.D. 1864, February 11.—No. 361.

DENNY, Abraham and DENNY, Edward Maynard.—"Im"provements in the manufacture of bacon and in apparatus

" connected therewith." This manufacture is termed by the patentees the " dry cure," and their object is to effect it either in summer or in winter.

The walls of the house are " divided by air chambers so as " to render the inside as free as possible from external " atmospheric influences." There are two floors, the lower one being " the curing house," and the basement (whereon the meat is laid) is formed by preference of flag stones. A series of cooling pipes are suspended from beams " which carry the " arching " of the curing house, and the pipes communicate at one end with a supply tank and at the other with a cooling tank. The supply tank is set on the upper floor, and, being " above 12 feet above the level " of the cooling pipes, a rapid passage of the cooling liquid through the series is ensured. The patentees recommend that the cooling pipes should be " 5 inches internal diameter, spaced 2 ft. 6 inches clear." The cooling tank contains ice or a mixture of ice and salt; it has a tightly fitting cover, and connected with it is a filter through which the contents flow into a pump tank. There is a tap or valve at the end of the cooling piping which enters the cooling tank. A pump forces the contents of the pump tank into the supply tank. "The lifting power of the pump and the " discharge from the valve " may be so adjusted that a constant circulation of brine " can be maintained at the desired tem- " perature." The quantity of piping used by the patentees is sufficient to reduce the temperature and keep it at from 45° to 50° Fahr.

By connecting the flow and return pipes with a small boiler the liquid can be heated and the temperature be raised during cold weather.

Instead of using a filter, " a quantity of cooled pickle " may be stored in " a tank underground " and be pumped up when settled.

[Printed, 8*d*. Drawing.]

A.D. 1864, February 15.—No. 387.

FONTAINEMOREAU, PETER ARMAND, le comte de. — (*A communication from Charles Tellier.*)—" Improvements in the " manufacture of methylic ether and its application to the " production of artificial ice." The manufacture is effected " by causing a reaction of sulphuric acid on methylic alcohol."

A mixture of equal parts of the two is heated, and when the temperature has reached 120° Centigrade, "a current of "alcohol is caused to arrive constantly into the mixture kept "up to the aforesaid temperature." The "disengaged ether" is then "washed to separate all foreign matters;" it is then "brought on to sulphuric acid or alcohol;" the pure ether is then separated by means of fire or water and "subjected to a "proper pressure when it becomes liquid in a suitable "receiver." This product "serves for the manufacture of "ice" by reducing it to vapour, and "every kind of apparatus for facilitating the vaporisation of ether and producing ice, the result of such gasification," may be used. The vaporised ether is again used by causing it to be absorbed by means of sulphuric acid, and this new product, "sulpho-methylic acid," has the property "to become decomposed "by heat or the addition of water."

When heat is employed, the decomposition begins at from 50° to 60° Centigrade; but as a certain pressure is required, and this pressure "is opposed to the decomposition," and the temperature must not exceed 120°, "a very small quantity of "products" is obtained. To obviate this, "supersaturation" is employed; the first part of sulpho-methylic acid" is decomposed "under a pressure of two atmospheres only;" the product is collected into a vessel already containing sulpho-methylic acid, and thus there is formed "a super-"saturated liquid which is then easily decomposed, giving the "product sought for abundantly."

When water is added, the use of alcohol is preferred to that of sulphuric acid. A solution of chloride of calcium is mixed with alcohol saturated with ether and contained in closed vessels. As soon as the decomposition begins, "it can be "greatly assisted by the action of heat." Two layers are immediately formed in the liquid, "one of ether and one of "water saturated with chloride of calcium and alcohol." The ether is rectified "by a simple distillation or a new washing;" the other is caused to pass into a rectifier, "which reproduces "continuously the first matters."

The apparatus employed and the mode of operating therewith are fully described, but the inventor does not restrict himself "to the details as regards the form, dimensions, or "construction of the apparatus, or to the proportions of the

" chemical agents, or order of the operations;" he claims (1) the manufacture of the methylic ether collected in a gaseous state in a mixture of sulphuric acid and sulpho-methylic acid and afterwards separated therefrom by heat or water; (2) replacing the mixture of acids by alcohol and water by any suitable liquid; (3) producing ice by the vaporisation of such methylic ether.

[Printed, 1*s*. Drawing.]

A.D. 1864, June 16.—No. 1501.

MACARTHY, JOHN.—(*A communication from Edward Preble Torrey.*)—(*Provisional protection only.*)—" Improvements in " apparatus or means employed for freezing or cooling fluids " or other matters." The apparatus consists of an outer vessel, an inner vessel, and a rotating beater, and the improvements relate principally to the beater and the spindle which carries it.

The beater is " combined with a scraper " which scrapes off the frozen particles from the inner surface of the inner vessel as fast as they are produced.

The spindle carries also an arm (one or more) which rotates in the space between the vessels, so as to constantly agitate the freezing mixture.

The inner vessel is kept from rising or floating by means of a central pivot which rests in a socket formed in a bar across the bottom of the outer vessel, and by means of feet or other projections which, when the inner vessel is turned partly round, engage with the bar.

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 21.—No. 1821.

WHITFORD, JOHN. — " Improvements in machinery or " apparatus for agitating freezing mixtures for cooling wine " and other liquors or liquids, and for manufacturing ice and " ice cream." The outer vessel of this apparatus is a tub, on the top of which a frame of metal is fixed. At the sides within the tub are stationary projections or agitators, and in the bottom is a central pivot. On the pivot stands a cylindrical skeleton frame composed of a base, an open rim, and diagonal or spiral ribs fixed to or cast on the base and rim. The rim is notched, and a cover similarly notched fits on to the frame, so that both can turn together. At the top of the cover is a shaft carrying a bevel wheel and connected to the metal frame and a handle by gearing, which the patentee describes but does not claim.

A bottle, can, or other vessel containing the substance to be cooled or frozen, is placed inside the skeleton frame, and when revolving motion is given to the frame, "it agitates the "freezing mixture, throwing it violently against the stationary "agitators, thereby causing it to be thrown back on" the bottle, can, &c.

The skeleton frame may have inside it "a white metal "freezing cylinder" for holding the substance to be frozen. The cylinder is provided with a cover, and a stationary shaft, carrying stationary agitators, passes up from the bottom through the cover and through the cover of the skeleton frame.

As many machines as desired "may be worked from one "driving shaft turned either by hand or by power."

[Printed, 10*d*. Drawing.]

A.D. 1864, September 13.—No. 2235.

KIRK, ALEXANDER CARNEGIE.—"Improvements in the manu-"facture of ice." The object of this invention is "the pro-"duction of ice more transparent and solid than heretofore."

The outer vessel is of any material, by preference a bad conductor of heat; it contains water, "part of which only "it is intended to form into ice." The inner vessel is of some good conducting material; its under side is in contact with or slightly immersed in water. The bottom of the inner vessel is kept at a temperature below 32° Fahr. by a freezing mixture inside, which flows in through one pipe and out through another. Ice will be formed on the under side of the inner vessel.

In another arrangement the inner vessel is "an upright "narrow vessel," and in order that the ice "may be more "easily detached" from it, the sides "project at the ends "and bottoms like a pair of double flanges." Between the flanges and projecting beyond them is a wooden frame by which the inner vessel may be fixed inside the outer one. This frame "will prevent the ice from forming round the "ends" of the inner vessel and "thus becoming attached

" either to the piece of ice formed on the other side or to the " bottom of the vessel."

If several inner vessels are used in the same outer vessel, they should be placed at such distance apart that " some " unfrozen water may be left between the pieces of ice."

[Printed, 8*d*. Drawing.]

A.D. 1864, October 28.—No. 2666.

LAIDLAW, DAVID, and **ROBERTSON**, JAMES.—" Improvements in exhausting, forcing, compressing, heating, cooling, " and applying aeriform bodies, and in apparatus therefor." The patentees describe in one portion of their Specification an apparatus for refrigerating liquids by means of " the re-ex- " pansion of compressed air."

The details of the compression pump which they use are given in an earlier part of their Specification. The compressed air passes through a pipe into " a sort of surface condenser," and inside this condenser " through a system of piping " which is composed of " horizontal rings connected by short " vertical tubes alternately at opposite sides." On entering the first ring the air " divides into two currents, which pass " by opposite sides of the ring to the first vertical connecting " piece, where they meet from directly opposite directions to " rise and divide, and meet again repeatedly in each ring " until the top is reached." The air issues from the top of the condenser through a pipe which admits it into the main air space of the freezing trough. Here the air expands, and in doing so extracts heat from a series of moulds containing liquid. The expanded air passes off by an outer space (which serves as a non-conducting jacket for the main inner space) " into a jacket space surrounding the condenser and thence " by a worm through the middle of the condenser," finally returning to the compressing pump or being ejected " into the " the atmosphere." The system of piping and the worm are surrounded with water which " may be supplied from any " convenient source."

The patentees describe " a modification in which instead of " the surface condenser arrangement provision is made for " cooling the air by introducing water into it." The compressed air passes into a reservoir divided by a diaphragm of wire gauze, through which the air ascends. A little above the diaphragm is a pipe with a perforated rose; this admits water, which mingling with the air abstracts heat therefrom; the passage of the air thence into the trough is described in the Specification.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1864, December 1.—No. 2995.

HARRIS, Thomas.—(*A communication from George Harris.*)—"An improved method for constructing rooms or places for "curing and preserving meat or other perishable articles." This invention consists in the combination of a curing or preserving room (or rooms) with an ice house and in the "peculiar construction" thereof.

The walls of the building are of brickwork, double and having the space between filled with charcoal or other non-conductor of heat. The curing or preserving room is partially or wholly beneath the surface of the earth; the floor is of stone or tile and has a layer of non-conducting material under it. The floor of the ice room forms the ceiling of the curing room; it is of metal and supported by girders and pillars; it slopes towards the sides, where it is furnished with gutters and pipes for conveying away the drippings, &c. of the ice. The ice room is provided with air traps and with trap doors in the ceiling. The doors and the ceiling are protected by means of an inner lining and a packing of non-conducting material. The roof of the building is by preference thatched.

[Printed, 10*d*. Drawing.]

A.D. 1864, December 8.—No. 3062.

BROOMAN, Richard Archibald. —(*A communication from Marcar Beylik'g.*)—"Improvements in apparatus for cooling "and freezing." This apparatus produces artificial cold "by "the vaporisation of a volatile fluid, the same quantity of "which may be used over and over again." A cylinder is "fixed upon the base" of a water reservoir, and its piston is worked by a rod united to a crank in connection with a fly wheel. A bent tube leads from the side of the cylinder into a "mercury well." Above the mercury well is a "pressure "chamber;" on one side of this chamber is a "tubular "branch" whence rises a "conducting pipe which places the "interior of the condenser in communication with the pressure

" chamber," and from the top of this chamber rises a " suction " pipe," which at its other end enters the dome of " a tubular " steam boiler." The steam generated in the boiler is stored in the dome, and a " framing encloses the generator and " congelation receiver."

The "receiver" of the condenser is "surmounted by a " series of tinned iron tubes surrounded with fine cambric, " the rows of stitches of which are folded in loose nets ;" the upper ends of the nets dip into a water reservoir placed in the upper part of the condenser. A fan drives air round the tubes of the condenser, and, the cambric being "damped over " its whole extent by capillary attraction," the draught and " the heat from the condensation of the vapours" vaporise the water.

The reader must consult the Specification for the numerous valves, cocks, and gauges required for the apparatus; he will find therein a description of each part as well as an explanation of the action of the apparatus.

"The congealing receiver partakes of two special forms " dependent upon the ice to be produced." In one arrangement a cylinder becomes covered with a layer of ice, which is removed by a scraper and "deposited in powder in the ice " chamber." A "generator" is placed in a chamber which is " covered by a second chamber open at front and divided " into two compartments." In the bottom of one compartment are two openings; one "gives passage to the dome" of the generator, the other " receives the body of a screw propeller" which turns freely "round its vertical axis," and " toothed gearing transmits the motion to the shaft" of a cock. The other compartment holds the cylinder, the ends of which terminate in pipes communicating, one " with the generating chamber," the other " with the propelling chamber." A toothed wheel fixed to one end of the cylinder gears into a " wheel which receives motion from the spindle of the cock." Part of the cylinder dips into a trough which " is constantly fed " with the water intended for freezing." The whole apparatus (which together with its action is described in the Specification) is enclosed "in a double wood casing fitted at its upper part " with a cover and at front with a shutter."

In the other arrangement ice called "verglas" is produced:—The apparatus consists principally of "a rectangular

" wooden case lined with planks " and " a rectangular metal " box with polished surface and enclosed at every part." The box " is placed on the upper edges of the case," so that it can " move round its horizontal axis." The axle (which is hollow) fits " into stuffing boxes in the circulation pipes in the manner " above described." The sides of the box " which correspond " to the axis " are lined with " a perforated metal diaphragm " intended for the indirect distribution of the cooling medium."

The case is filled with water to be frozen ; the box is placed in a horizontal position " so as almost to cover the surface of " the water by plunging therein up to half of its depth ;" and a wooden cover with double lining completely shuts off communication with the outside. The water begins to solidify, and the sides of the box become covered with a layer of verglas. When the required thickness of ice has been formed, the box is turned on its axis so as to reverse the upper side, and a layer is then formed on that side.

[Printed, 2*s*. 4*d*. Drawings.]

1865.

A.D. 1865, January 2.—No. 4.

BEVAN, Edward, and FLEMING, Abel.—" An improved " jacket or protector for metallic and other vessels and structures containing solid substances, liquids or gases, to prevent radiation of heat from or communication of heat to " such vessels and structures." The patentees " insulate " vessels and structures by covering them with a jacket of any suitable material and large enough to admit of an air-space between them, thereby keeping the contents for a length of time " at or near the same temperatures and in the same conditions as they were when placed in the said vessels." To keep the inner and outer vessel apart, small pieces of earthenware or other non-conductor of heat are used.

In applying the invention to " ice safes and wine coolers," the jacket is generally a wooden case with a hinged cover, and the inner vessel is separated from the jacket by " wood, clay, " or glass pieces."

[Printed, 8*d*. Drawing.]

A.D. 1865, January 24.—No. 207.

HASELTINE, George.—(*A communication from Benjamin Markley Nyce.*)—"Improvements in the mode of and means "for preserving fruit and other eatables." A structure of the following description is required:—The ground between the walls is levelled and coated with some impervious substance. Thereon is laid a layer of chaff, and over the chaff are placed joists for the support and attachment of a vapour and water-tight floor of boards or sheet metal or tiles. The walls consist of an outer and an inner framework of scantling sheathed with metal, the parts which enclose the ice chamber being of zinc or plank. The space between the framework is packed with chaff or other non-conductor. The entrance is guarded by an outer and an inner door, and "the interior of these "doors" is packed with chaff. The inside of the structure consists of a chamber furnished with shelves and an ice chamber above it. The joists which support the floor of the ice chamber are of metal "and of the smallest practicable "upper surface" so as "to secure the greatest and most equal "exposure of every part of the floor to the air" of the preserving chamber. The floor is of galvanized iron and "descends slightly to one or more vents for the meltings of the ice." Above the ice is a cover of boards on a frame; on the cover is a layer of chaff; and chains or rods depending from the roof keep the cover at any desired height, "being let "down from time to time as the ice melts."

In the preserving chamber are "long shallow and flat-"bottomed troughs" open at their ends and slightly inclined in position; the bottoms are covered with a layer of chloride of calcium or its equivalent, "which as it deliquesces gradually "descends and is caught in a liquid form in a vessel." Part of the floor consists of a large basin made of galvanized iron or lead or porcelain, according to the acid used; "as the water "collects in the basin," it runs through a pipe to the outside. Fans, driven by wind wheels or other power, "bring every "particle of the contained air successively in contact" with the contents of the chamber. A hygrometer is used "to "regulate to a nicety the exact hygrometric condition of the "contained air."

[Printed, 8*d*. Drawing.]

A.D. 1865, January 26.—No. 230.

FALCK, Charles.—" Improvements in apparatus called ice " safes." The outer and inner casings of the safe are made (by preference) of tinned iron, and the space between them (except at the bottom) is filled with a non-conductor of heat; the space at the bottom is left empty to serve as a reservoir for the water produced by the melting of the ice. The door in front of the safe and the lid on the top of the ice compartment are made double, and the intervening space is filled with non-conducting material. The safe is divided into two compartments; the front one is fitted with shelves, and the back one is the ice chamber. The back compartment contains ice and a cylinder "for containing water to be cooled." A pipe passes from the bottom of the cylinder to the outside of the safe where it is fitted with a tap; and a passage leads from the bottom of the ice chamber to the empty space at the bottom of the casings. The water from the ice is drawn off from time to time by means of another tap.

[Printed, 8*d*. Drawing.]

A.D. 1865, March 11.—No. 691.

HENDERSON, James.—" Improvements in the process and " apparatus for refrigerating or freezing liquids." The object of the patentee is "to obtain solid blocks of ice of a " size and form suitable for transportation, packing, and sale." The vessels used are (by preference) of thin metal, square and shallow if they are to remain stationary while the freezing is going on, deep but narrow if they are to be put in motion. Some vessels are octagonal and made with a central opening " up which the air may be circulated for the purpose of carry- " ing off the caloric which radiates from the exposed inner " sides of the vessel." In all cases the sides are inclined so as to facilitate the removal of the ice, and all are provided with flanges whereby they may be suspended in frames. Rows of the vessels filled with water are arranged on frames of several stories and are exposed to the action of the air during frosty weather.

The freezing may be facilitated "by causing an artificial " current of cold air to play upon the exposed surfaces of the

" metallic vessels," and the patentee describes four arrangements for this purpose :—

1. A rotatory fan or other blowing apparatus may be employed.

2. The sides of the frame or structure in which the vessels are placed may be constructed with " moveable louvre board- " ing which is mounted in frames."

3. The frame may be mounted on a horizontal platform which is made to revolve rapidly through the air.

4. The frames may be suspended from centres and " rotated " in a vertical plane " by motive power applied to the axle of a large rotating frame.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, May 22.—No. 1405.

JOHNSON, John Henry.— (*A communication from Henry Nicholas Dallemagne.*)—" An improved apparatus for freezing " iceing, and cooling liquids." This apparatus is usually made in the form of a decanter and of glass. The inner vessel (which holds the freezing mixture) is blown inside the outer one; each has its stopper, the outer one at the top, and the inner one at the side of the outer one. There is no communication between the two vessels, but the inner one " may be " connected to the outer one by screwing."

The mixture preferred by the inventor consists of 5 parts of sal ammoniac, 5 of nitrate of potash, and 16 of water, or of equal parts of nitrate of ammonia, hydrated carbonate of soda, and water.

Any shape may be given to the vessels; their relative capacities should be, " if the capacity of the inner vessel be " one quart, that of the surrounding space inside the outer " vessel should be about 0·750 of a quart."

[Printed, 6*d.* Drawing.]

A.D. 1865, July 5.—No. 1775.

LONGBOTTOM, John, and LONGBOTTOM, Abram.—" An " improved combination of materials for the manufacture of " carpets, floorcloth, felt, wall paper, fireproof flexible roofing, " ship and boat building, and for other similar purposes." This combination, called by the patentees " kampakaon," is applicable to the construction of " ice bins " as well as to many other purposes; it is made in the following manner, but the patentees do not restrict themselves to the stated proportions or temperatures:—

(1) They dissolve 5 lbs. of india-rubber in 20 gallons of coal tar naphtha and add to 1 part by weight of the solution 2 parts by weight of finely powdered shellac. (2) They dissolve and mix in 5 pints of water (at a temperature of 190°) 4 oz. of alum, 2 oz. of sulphate of ammonia, 4 oz. of boracic acid, 5 oz. of glue, 5 oz. of molasses, 5 oz. of boiled linseed oil, and 10 oz. of hydrochlorate of ammonia. (3) They blend the mixtures at a temperature of 200°. (4) They heat or boil any woody or fibrous material in a solution composed of equal parts of double sulphate of potassa and alumina, sulphate of iron and borax. (5) They put the blended solutions with the necessary quantity of the heated material into a mixing machine enclosed (by preference) in a steam jacket, which must be kept up to a temperature of from 150° to 200°. (6) They work the mixed mass in a masticator heated to 150°. (7) They pass the mass several times through a series of heavy rollers, the first being of the same heat as the mass when taken from the masticator, the others gradually cooler, and the last nearly cold. (8) They submit the now formed kampakaon to a cold bath of metallic salts.

If the article is to be of extra strength, they insert veneerings of wood between thicknesses thereof.

They also submit blocks of fibrous peat or turf "to a steep- " ing process in the compositions before named" and thereby render it "elastic, fireproof, and fitted for many useful pur- " poses."

[Printed, *4d.* No Drawings.]

A.D. 1865, August 31.—No. 2244.

ASH, HENRY CLARKE.—"Improvements in ice safes." The advantages claimed for these safes are (1) that a filter is connected with the ice tank, thereby utilising the water produced by the melting of the ice, (2) that the ice tank is provided with a cover which serves as an additional shelf, descends as the ice thaws, and thereby preserves the ice and the water " from contamination."

The case of the safe is double (except at the bottom, and the intervening space is filled with non-conducting material; it has two lids, an outer and an inner one. The inner case (lined by preference with zinc) is divided into three compartments; the middle one is the ice tank; the others are fitted with shelves. A covered filter fits into the lower part of the tank and is cemented into it. Over the filter is a false or removable bottom whereon the ice (by preference a block of ice) rests. A zinc cover rests on the top of the ice; the top of the cover is flat; and as the cover descends (as the ice melts) into the inside of the tank, the ice is not "tainted with the smell of anything which may be put into the safe," and the water drawn off from the filter "will be ice-cold and very pure."

[Printed, 10*d*. Drawing.]

A.D. 1865, September 6.—No. 2292.

PARKER, Augustus William.—(*Provisional protection only.*)— "Improvements in ice houses, and in glaciaria or skating "places, and in baths." The object of this invention is "to "maintain ice or liquid in a refrigerated or congealed con- "dition."

A chamber is "provided with any ordinary arrangements "for preventing conduction of heat from its interior," or it may be constructed "of some conducting surface, over which "a stream of water is caused to flow and thereby absorb heat." On the floor or in a tank fixed therein is a refrigerator formed of a coil of pipes and surrounded with water to be frozen. Sometimes "a similar arrangement" is suspended "over the "water." Through the coil passes ether or other volatile liquid or liquid carbonic acid or other liquefied gas or ammoniacal gas. For condensing the volatile gases or cooling the absorbing liquors there is generally used a coil or worm of horizontal tubes placed one over the other, over which streams of water are caused to flow. Sometimes instead of evaporating the liquor in the refrigerator, there is combined therewith a vessel containing a worm surrounded with brine or other liquor which will not congeal at 32° Fahr., and the cooled liquor is caused to circulate through the refrigerator. Salts may be dissolved in water or mixed with ice or snow and be carried into the refrigerator.

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 18.—No. 2377.

JEYES, Oliver Weldon.—(*Provisional protection only.*)—"An "improved method of making effervescing drinks." The inventor makes ice in a vessel partly filled with water into which carbonic acid gas is forced. He hermetically seals the vessel; freezes the contents into a solid state; opens the vessel, and takes out the ice, "which is to be employed "in more or less large blocks in the drink to be made "effervescing."

[Printed, 4*d*. No Drawings.]

A.D. 1865, September 27.—No. 2473.

GILLET, Louis Henri.—"Improvements in the construction "of vessels for preserving food and liquids." This invention relates (1) to the construction of cases for preserving food, &c. and for "heating the same by means of alcohol" when required, (2) to the construction of cases "for maintaining water "and other liquids, but especially water, at a low tempera-"ture."

1. The case is usually of tin, cylindrical, and made with two bottoms so that a space is left between them. The lower bottom has a circular rim outside the cylinder, and two holes are pierced through the space. When the case is filled, a cover is soldered on; one of the holes is stopped up; the space is filled with alcohol, and the other hole is stopped up. When it is required to use the contents, one or two holes are made in the cover; the stoppers are taken out; the alcohol flows into the rim, and being set on fire, the contents "are quickly "raised to the desired temperature."

2. A decanter or other vessel is filled with water, and the water is frozen. The decanter is then put into a case which is open at the top and surrounds the neck of the decanter. The space between the decanter and the case is filled with sawdust or other isolating material, and the top and bottom of the case are closed with covers.

[Printed, 8*d*. Drawing.]

A.D. 1865, September 28.—No. 2483.

REECE, Rees.—(*Provisional protection only.*)—"Improvements "in obtaining and applying sulphurous acid, and in apparatus

c 2

" used therein." The "liquid sulphurous acid" obtained " produces an intense cold on its conversion into gas" and may be used " for the purpose of refrigeration and congela- " tion."

The apparatus employed consists of a refrigerator, a gasifier, and a condenser. The refrigerator consists of two coils of leaden or other piping one within the other. The gasifier is an air-tight vessel lined with lead and containing " a worm of " lead coiled from top to bottom as close as possible;" each coil has a siphon connected to it "to collect the sulphurous " acid condensed, which is made to irrigate the coil below;" the vessel is provided with an inlet and an outlet pipe. The condenser is a coil of leaden or other piping whereto a receiver is attached. The refrigerator and the condenser are put into separate vessels, each containing a frigorific mixture.

The vessels are connected in the following manner:—The " outer coil of the refrigerator" is connected to "the bottom " of the coil" in the gasifier; " the top of that coil" is connected with "the inlet of the condenser, the outlet of which " communicates with the inner pipe of the refrigerator." The condenser is placed over the gasifier. The receiver is connected "to the inlet pipe" of the gasifier, "through which " flows the liquid sulphurous acid and is distributed in a thin " stream over the coil, producing intense cold and converted " into gas and escapes through the outlet pipe."

In applying cold produced by the evaporation of liquid sulphurous acid, a vessel is fitted "into a leaden jacket perfectly " gas tight." The space between them is provided with an inlet and an outlet pipe, the inlet being connected "to a reservoir " of liquid sulphurous acid," and the outlet "communicating " with a worm and receiver contained in a frigorific mixture." The acid is made to pass "into the jacket space" in a continuous stream, abstracting heat from the fluid contained in the inner vessel; it is "converted into gas and passes into " the condenser," where it is "liquefied and used over " again."

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 27.—No. 3043.

LAKE, WILLIAM ROBERT.—(*A communication from Benjamin Markley Nyce.*)—" Improvements in the mode of and means "for preserving fruit and other perishable substances." This invention relates to the construction of a "dark air, heat, and "moisture-tight chamber" kept cool to a temperature of from 34° to 37° Fahr.

The basement is composed of a foundation wall, a layer of asphalt or tar, a layer of dry chaff or other bad conductor of heat, a plank floor, and a galvanized iron floor. The walls are double, lined with sheet iron, and the space between them is loosely packed with chaff or shavings. Access to the chamber is gained by means of "outer and inner heat-tight "doors." The top of the chamber is the galvanized iron floor of an ice chamber provided with a discharge pipe. Above the ice chamber is "a loose floor" covered with filling. The preserving or lower chamber is furnished with shelves; on the floor are spread absorbents, namely "refuse bittern of "salt and chemical works;" and the moisture of the chamber is measured by a hygrometer.

"As the fruit gradually ripens, the oxygen of the contained "air unites with the hydrogen and carbon and forms water "and carbonic acid, which in a few days is entirely con- "sumed."

[Printed, 8*d*. Drawing.]

1866.

A.D. 1866, February 21.—No. 540.

RICHARDSON, Benjamin Ward.—(*Provisional protection only.*)—"Improvements in the means of and apparatus for "refrigerating or freezing liquids, and for producing ice." The cold is produced "by the contact of pulverized spray of "volatile liquid," namely ether or volatile hydrocarbons or the hydrocarbon products from gasworks; and the chief object of the invention is "to supply a portable apparatus for the "purpose of refrigerating or freezing small quantities of "liquid."

The liquid to be refrigerated is put into a metallic vessel shaped like "an inverted cone." This vessel contains "a false perforated small cone" having a handle whereby it may be lifted out from the outer vessel "and withdraw the "frozen particles of of the liquid."

The outer vessel stands in a cylinder, at the bottom of which is a reservoir for containing the volatile fluid; and the fluid is pumped thence through a series of tubes on and around the circumference of the outer vessel. The pump is "controlled by suitable valves," so that the fluid is impelled "in the form of dew or spray."

To cool wine the bottle is put into a cylinder, and the fluid is pumped on to the bottle.

The inventor does not limit himself to the shape of the outer vessel or to the application of only one vessel; he also mentions modifications of some parts of the apparatus.

[Printed, 4*d*. No Drawings.]

A.D. 1866, February 28.—No. 613.

NORMAN, John, and COPELAND, James.—"Improvements "in apparatus for producing ice," by means of currents of brine or other fluid having a temperature below 32° Fahr., and more particularly by the formation of ice "on the outside "of vessels or passages" containing the cooling fluid.

The freezing tank is of a long rectangular form having the bottom and sides of wood and the ends of cast iron. One of the ends is made with the ribs on the inside forming seats for "the ends of four tubular slabs or partitions" which pass through stuffing boxes in the other end. Each slab is composed of a number of tubes "of a long rectangular cross section." The tubes (by preference of copper) are combined "by brazing "them edge to edge," the whole "being tinned over exter-"nally and internally when completed." The inner ends of the tubes are closed, "but so as to communicate with each "other in pairs." The outer end of each slab has fixed on it a brass flanged piece, by means of which there is bolted to it a cast-iron box "formed with upper and lower flanged openings" and with "internal partitions which direct the currents of "brine into the tubes." The boxes may be connected "in "various ways" with the inlet and outlet pipes for the brine so as "to provide for the circulation of the brine through the "machine or apparatus in which it is cooled, thence to and "through the water tank, and back again to the cooling "machine." It is often convenient to connect two slabs by

" branches fitted to the upper openings of the end boxes; " in this case "the bottom openings of the connected boxes are " connected by a four-way cock " which communicates with the inlet and outlet pipes.

As the long slabs of ice formed on the tubular slabs " are " inconvenient to handle," dividers, consisting each of " a " pair of tubes closed at their bottom ends but open above, " and united by a saddle piece at the top," are placed astride of the slabs at the ends and at intermediate points. Warm water poured into the dividers and the slabs at once loosens the blocks of ice.

The patentees base their invention on the one for which Letters Patent were granted to Mr. Kirk, dated September 13th, 1864, No. 2235.

[Printed, 10*d*. Drawing.]

A.D. 1866, March 17.—No. 800.

JEYES, Oliver Weldon.—(*Provisional protection only.*)—" An " improvement in the manufacture of ice to fit it for making " effervescing drinks." A vessel is partly filled with water; carbonic acid gas is forced in; the vessel is hermetically sealed; the contents are frozen into a solid state; the vessel is then opened, and the ice is taken out. The ice " may be " employed in more or less large blocks in drinks to be made " effervescing."

[Printed, 4*d*. No Drawings.]

A.D. 1866, April 28.—No. 1198.

BURNARD, George, and KOPPEL, Ludwig.—(*Provisional protection only.*)—" An improved mode of and apparatus for " preserving milk and cream, more especially designed for " keeping milk fresh during transport;" namely by the introduction of ice into the milk can and by preserving the ice by the application of a non-conducting chemical compound.

Tubes of tin or other suitable metal are united at their upper ends by a plate which rests on brackets soldered to the top of the can. The tubes extend to about the middle of the can; they are of such diameter as to hold ice sufficient for preserving the milk at the desired temperature. They are lined with flannel, and at their lower ends are strainers through which the water descends into a receptacle at the bottom of the tubes. The receptacle is large enough to hold all the water from the melted ice and can be emptied through a hole closed by a plug. The tubes are enclosed in a chamber which contains (by preference) equal quantities of sal ammoniac and nitre; other compounds of a like nature may be used.

[Printed, *4d.* No Drawings.]

A.D. 1866, May 9.—No. 1327.

JONES, John Allcock.—"Improvements in the manufacture " of non-conducting substances for impeding the passage of " heat." The substances used are "peat, turf, bog, silt, or " other similar accumulations of vegetable or partly vegetable " and partly earthy matter," either alone or in combination with other ingedients, such as "Portland or Roman cement, " oxide of iron, lime, sand, cow hair, gypsum or sulphate of " lime, and mineral oil."

The following proportions "give a good result:"—Peat, " turf, bog, silt, or a mixture of them, 100 lbs.; cement, 20 lbs.; oxide of iron, 15 lbs.; lime, 10 lbs.; sand, 10 lbs.; cow hair, 4 lbs.; gypsum, 2 lbs.; mineral oil, 4 lbs. The ingredients are to be well mixed by friction, adding water or other liquid sufficient to reduce the mass to a plastic composition. Any one of the ingredients (except the peat or its equivalent) may be omitted; the proportions may be changed; other ingredients may be added.

When the mass is used as a coating, stability may be given to it by covering it with "wire netting" and coating the whole with tar or paint.

The mass, if made into cakes, blocks, or bricks," will be " found useful for lining or building wine cellars, ice houses " and like structures.

[Printed, *4d.* No Drawings.]

A.D. 1866, July 23.—No. 1910.

SOVEREIGN, Levi Lemon.—(*Provisional protection only.*)— " An improved implement for beating and cutting meat and " other substances." One part of this implement will be found useful for cutting or chopping ice. It consists of a beater combined with a blade or cutter. The beater is made of tough metal, and on its face are teeth (by preference) square or oblong and slightly rounded at their outer extremities. The shank is "provided with a hole for the insertion of a handle;" it extends beyond the handle and "is formed with a lug or " projection for supporting the cutting or chopping blade." The blade is of steel and secured to the shank by screws, so as to be easily removable and to allow blades of different size and form or another beater with differently shaped teeth to be fastened thereon.

[Printed, 4*d.* No Drawings.]

A.D. 1866, October 11.—No. 2632.

WATSON, William.—(*Provisional protection only.*)—" Im-" provements in provision safes." A current of air is caused " to pass up through the bottom of the safe and out at suitable " openings in the top."

A frame of wood or other material is formed with doors in front or other suitable part, and the sides consist each of two sheets of metal placed a short distance apart, the inner sheet being perforated. If the safe is of large size, the interior is divided horizontally into two or more parts; there may be also vertical partitions made double and perforated or not.

The bottom and the horizontal divisions are of the following construction:—The bottom of a frame is covered with finely perforated zinc, whereon is laid finely crushed animal or vegetable charcoal or other suitable disinfectant; this is covered with another frame which is hinged to the back or sides of the safe "and is provided with one or more thick-" nesses of perforated zinc." Pans, containing ice or other cooling material, are placed on the bottom and shelves or horizontal divisions of the safe.

The shelves or horizontal divisions may be constructed without the addition of a disinfectant; they may be "solid or " without perforations."

[Printed, 4*d.* No Drawings.]

A.D. 1866, November 26.—No. 3112.

SHALER, Nathaniel Southgate.—" Improvements in pre-" serving animal and vegetable substances." The building represented in the annexed sheet of drawings as applicable to the purpose of this invention is "two stories high," and the walls are made "of a good non-conductor of heat." The lower chamber is kept charged with carbonic acid gas; it is provided with one or more racks or frames carrying trays or shelves, which can be raised to the upper chamber through openings in the intermediate floor. The top and the bottom of the racks are made to close the openings, when the racks are lowered or raised. At the top or other convenient part of the lower chamber is an apparatus for cooling the gas; it consists of "a winding passage" surrounding vessels which contain ice or a freezing compound, and (connected to the passage) a pipe, wherein is a fan, which when caused to revolve draws a current of air through the pipe and the passage. The gas by passing through the apparatus "will be deprived of its moisture which "will be frozen or condensed on the side walls of the chamber "or on the exterior of the vessels." Other means may be adopted "for cooling and consequently drying the gas," as well as for introducing the articles to be preserved into the lower chamber and for removing them therefrom; in the above-described arrangement they are placed on the trays of the racks.

[Printed, 8*d*. Drawing.]

APPENDIX.

A.D. 1827, August 13.—No. 5539.

JARRIN, William Alexis.—"Improvements in apparatus for "cooling liquids." This apparatus consists of an outer and an inner vessel; they may be made of any suitable material and of any shape; they are however usually cylindrical.

In the apparatus described by the patentee the outer vessel is 17 inches in height and 11 in diameter; the inner one is 16 inches in height and 5 in diameter; each is provided with a cover, and the inner one with handles. The inner vessel contains 9 lbs. of ice and 3 lbs. of salt or saltpetre, and the liquid to be iced is poured into the space between the vessels.

Wine, &c. may be iced at the same time as the water by putting it into the inner vessel.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 7 (*third series*), p. 328; London Journal (*Newton's*), vol. 3 (*second series*), p. 260.]

A.D. 1862, June 4.—No. 1684.

TOSELLI, Giovanni Battista.—"Improvements in apparatus "for freezing and cooling liquids and mixing syrups." This apparatus is hung between uprights so that it may have given to it "a horizontal rotary motion in order that the refrigerating "compound shall act quickly and efficaciously," and that "the position of the liquids to be congealed" shall be continually changed "for the purpose of disengaging the air."

The apparatus consists of an outer casing, an inner cylinder, and a cover at each end closed air-tight by pressure screws. The casing may contain any non-conductor of heat, or it may be utilised by pouring into it water to be cooled. The liquid to be frozen is put into the inner cylinder, and the refrigerating compound into the space between the casing and the cylinder.

To charge the apparatus, remove the covers; pour the liquid into the cylinder; hermetically close the cylinder by means of its cover and a caoutchouc washer; reverse the apparatus; put in the refrigerating compound, and put on the other cover.

An apparatus "to freshen any liquids" very rapidly consists of "two cylindrical and concentrical recipients or receivers "within each other" united by a "rotatory axis which rests "on two lateral supports;" it is charged by means of two tubes opposite each other, the one connected to the outer recipient, the other to the inner one and passing through the outer one; each tube is provided with a stopper.

The apparatus may be mounted so as to oscillate instead of revolving, an arrangement which the patentee claims but does not recommend.

[Printed, 10*d*. Drawings.]

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5. PATENT RIGHTS in the COLONIES.—Abstract of Replies to the Secretary of State's Circular Despatch of July 11, 1856, calling for Information as to the form of the application to be made by persons desirous of obtaining Patent Rights in the Colonies, and the expenses attendant on the Grant of such Patent Rights. Price 2*s.*; by post, 2*s.* 1½*d.*

6. COPY of AMERICAN PATENT SPECIFICATION, and other DOCUMENTS relating to an invention of "A new and useful "improved method of removing incrustation from boilers," presented by Davis Embree, of Dayton, Ohio, United States of America, to The Government and People of the United Kingdom of Great Britain and Ireland, 21st April 1865. Price 6*d.*; by post, 6½*d.*

7. SUPPLEMENT to the SERIES of LETTERS PATENT and SPECIFICATIONS, from A.D. 1617 to Oct. 1852; consisting for the most part of Reprints of scarce Pamphlets, descriptive of the early patented Inventions comprised in that Series.

CONTENTS.

1. Metallica; or the Treatise of Metallica, briefly comprehending the doctrine of diverse new metallical inventions, &c. By SIMON STURTEVANT. (*Letters Patent, dated 29th February* 1611.) Price 1*s.* 4*d.*: by post, 1*s.* 5*d.*
2. A Treatise of Metallica, but not that which was published by Mr. Simon Sturtevant, upon his Patent, &c. By JOHN ROVENZON. (*Letters Patent granted A.D.* 1612.) Price 4*d.*; by post, 4½*d.*
3. A Commission directed to Sir Richard Wynne and others to inquire upon oath whether NICHOLAS PAGE or Sir NICHOLAS HALSE was the first inventor of certaine kilnes for the drying of malt, &c. &c. (*Letters Patent, Nos.* 33 *and* 85, *respectively dated 8th April* 1626, *and 23rd July* 1635.) Price 2*d.*; by post, 2½*d.*
4. DUD DUDLEY'S Metallum Martis; or iron made with pit-coale, sea-coale, &c. (*Letters Patent, Nos.* 18 *and* 117, *respectively dated 22nd February* 1620, *and 2nd May* 1638.) Price 8*d.*; by post, 8½*d.*
5. Description of the nature and working of the Patent Waterscoop Wheels invented by WILLIAM WHELER, as compared with the raising wheels now in common use. By J. B. W. Translated from the Dutch by Dr. Tolhausen. (*Letters Patent, No.* 127, *dated 24th June* 1642.) Price 2*s.*; by post, 2*s.* 1½*d.*
6. An exact and true definition of the stupendous Water-commanding Engine invented by the Right Honourable (and deservedly to be praised and admired) EDWARD SOMERSET, Lord Marquis of WORCESTER, &c. &c. (*Stat.* 15 *Car. II. c.* 12. *A.D.* 1663.) Price 4*d.*; by post, 4½*d.*
7. Navigation improved; or the art of rowing ships of all rates in calms with a more easy, swift, and steady motion than oars can. By THOMAS SAVERY. (*Letters Patent, No.* 347, *dated 10th Jan.* 1696.) Price 1*s.*; by post, 1*s.* 0½*d.*
8. The Miner's Friend; or an engine to raise water by fire, described, &c. By THOMAS SAVERY. (*Letters Patent, No.* 356, *dated 25th July* 1698, *and Stat.* 10 *&* 11 *Will. III. No.* 61, *A.D.* 1699.) Price 1*s.*; by post, 1*s.* 1*d.*
9. Specimina Ichnographica; or a brief narrative of several new inventions and experiments, particularly the navigating a ship in a calm, &c. By JOHN ALLEN, M.D. (*Letters Patent, No.* 513, *dated 7th August* 1729.) Price 8*d.*; by post, 9*d.*
10. A description and draught of a new-invented Machine for carrying vessels or ships out of or into any harbour, port, or river against wind and tide, or in a calm, &c. By JONATHAN HULLS. (*Letters Patent, No.* 556, *dated 21st December* 1736.) Price 8*d.*; by post, 9*d.*
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12. The letter of Master WILLIAM DRUMMOND for the construction of machines, weapons, and engines of war for attack or defence by land or sea, &c. Dated the 29th September 1626. (*Scotch Patent, temp. Car. II.*) Price 4*d.*; by post, 4½*d.*
13. Contributions to the History of the Steam Engine, being two deeds relating to the erection by Messrs. Boulton and Watt of steam engines on the United Mines at Gwennap, Cornwall, and at Werneth Colliery, near Oldham, Lancashire. From the originals in the Patent Office Library. Price 10*d.*, by post, 10½*d.*

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——— (*Aeronautical Society*).
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Swindon, New (*Mechanics' Institute*).
Tamworth (*Library and Reading Room, George Street*).
Yarmouth, Norfolk (*Public Library, South Quay*).

British Colonies and Foreign States.

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——— Public Library, New Westminster.
France—Academy of Science, Paris.
Germany — Imperial and Provincial Library of the University, Strasburg.
——— Imperial Statistical Office, Berlin.
——— Polytechnic School, Carlsruhe, Baden.
Netherlands — Library of the Polytechnic School, Delft.
New Zealand—Athenæum and Mechanics' Institute, Dunedin.
Russia—Imperial Technological Institute, St. Petersburg.
Turkey—Literary and Scientific Institute, Smyrna.
Victoria—Schoolof Mines, Ballaarat.
United States—American Academy of Arts and Sciences, Boston.
——— American Institute, New York.
——— American Society of Civil Engineers, New York.
——— Industrial University Champaign, Illinois.
——— Mechanics' Institute, San Francisco.
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